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# welcome



The other day I had to make a couple of simple casement window sashes and, thinking about the job the night before, I couldn't remember if I had enough timber in stock to make a ready start or if an early morning trip to the timber yard would be necessary first. Now I always enjoy a visit to my local merchant. They're down by the docks near my workshop, and there's often a boat or two chugging past or some other pleasing nautical business going on; fishermen sorting out their nets against a moving backdrop of forklifts piled with boxes of fish, that sort of thing. All very nice, and just part of the fun that some people call work.

## Bright start

The morning dawned bright and clear, and it was with mixed feelings that I discovered a couple of lengths of joinery-grade softwood in my 'assortments' stack and hauled them out to make a start. I briefly considered heading down to the docks to buy some hardwood, but a combination of a low-budget job and the desire to get started convinced me to stay in the workshop. It was during the milling process, cutting and thicknessing my timber, that I felt The Feeling – familiar to all woodworkers – the feeling of joy and absolute pleasure in the working of this most rewarding of materials. Sustained for the whole day long, the job went (fairly) smoothly and it was with a considerable degree of satisfaction that I locked up that evening with a brace of rebated frames glued up and in cramps.

## Take it easier

Lucky me, I say, and to think that I (mostly) get paid to do it too! Perhaps an attitude change has been responsible... Lately, instead of tearing into the work like some industrious whirlwind, I work at whichever pace suits me that day. I find this makes for a much better job, and for a lot less worry and stress too. Customers no longer browbeat me into barely achievable deadlines. When asked the other day 'how long will the fitting take?' I found myself answering – and truthfully – that I actually didn't know. This was a good sign to me, and an indicator of a relatively worry-free site visit. And so it proved to be; apart from the dry sauna-like conditions and a close shave with some hidden cables, the job went very well and everyone concerned finished each day with a smile.

So, whether you're old or young, novice or vastly experienced, don't forget just how lucky you are to be in this business: the joyful business of working with wood.

*Mark*

You can contact Mark on [mark.cass@mytimemedia.com](mailto:mark.cass@mytimemedia.com)



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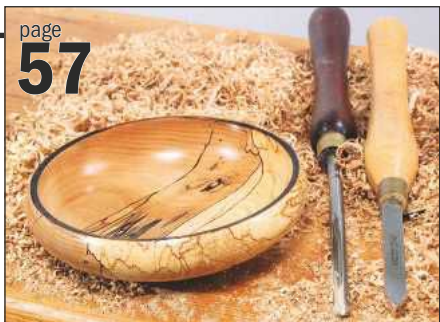


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## ON TEST

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March 2015

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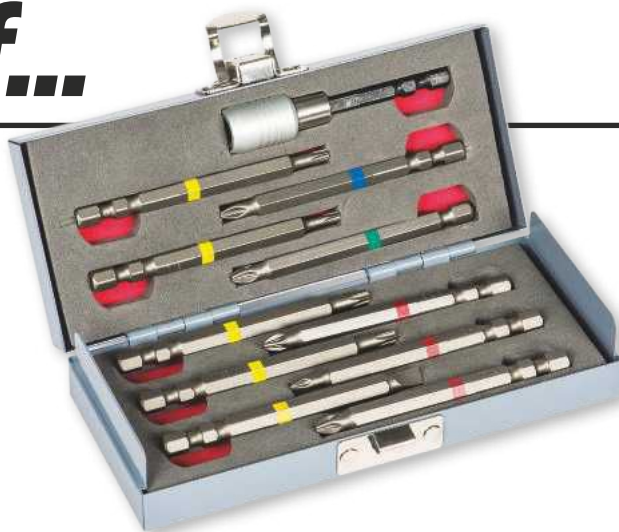
# In brief...

## Irwin makes an impact

The new Impact Performance range from Irwin Tools includes single and double-ended bits, quick-change extensions and a right-angle drill. There are also ten differently configured Pocket and Pro Set cases, all engineered specifically for use in impact tools.

The bits are manufactured with high-grade steel and are designed with precision tip geometry for superior fit and reduced cam-out, so they are able to withstand high torque outputs. They also feature Irwin's exclusive DoubleLok technology, which securely locks both ends of the bit into impact drivers and quick-change chucks.

[www.irwin.co.uk](http://www.irwin.co.uk)



## Just the drill

Axminster has just introduced its own range of trade-rated hex shank bits under the brand name Axminster Trade Bitz.

Most cordless drills and screwdrivers have a keyless chuck, and some only have a hex fitting. The shanks of Trade Bitz holders, long screwdriver bits and torsion screwdriver bits have a double groove and special machining that makes them compatible with all makes of 1/4in hex quick-change and magnetic bit holders.

Various sets are available. The 11-piece set illustrated comprises an 85mm quick-release bit holder and ten colour-coded bits with a sand-blasted finish. Two 28-piece sets are also available.

All three sets come in a robust steel storage case lined with industrial foam to prevent the bits rolling around. The bits are also available separately. Prices start at £18.96 for the 11-piece set, £2.26 for individual bits and £3.96 for bit holders.

[www.axminster.co.uk](http://www.axminster.co.uk)

## Spring show

Yandles have just announced the line-up of demonstrators for their forthcoming show on April 10-11. Mick Hanbury, Tracey Owen and Mary Ashton will be amongst the turners alongside Rod Page and, new to Yandles, Keith Fenton. Other attractions include Gary Orange (chainsaw carving), Loxtonwood Craft (side axe and adze planking), Lyme Regis Boat Builders and the Japanese Tool Group.

The show attracts thousands of visitors from all over the



UK and Europe. Joining the demonstrators will be lots of major manufacturers, including Record Power, Brimarc, Sorby and Triton, showing off their latest products and offering special show prices. There is free entry and parking for visitors.

[www.yandles.co.uk](http://www.yandles.co.uk)

## Triton triple

The new Triton T20 range consists of a multi-speed drill driver (£220), a combi drill driver with hammer action (£232), and an impact driver (£226). All three tools have 20V 4Ah batteries, and charging to 80 per cent capacity takes just 30 minutes. Other features include an over-moulded grip and a built-in LED work light.



A twin pack featuring the combi drill driver and impact driver with two 4Ah batteries and an intelligent charger is available for £300.87.

[www.tritontools.com](http://www.tritontools.com)

## Festool unplugged

The recent launch of Festool Unplugged sees a combination of new high-performance battery packs and brushless EC-TEC motors, plus the introduction of PowerSelect to offer users more buying flexibility.

The improved battery range sees all 15V and 18V batteries

increasing from 4.2Ah to 5.2Ah, so users can work for 25 per cent longer between charges. This change, plus the new motors, ensures optimal power usage and longer tool life.

PowerSelect offers three different buying variants. The Basic version includes the cordless tool without battery packs or charger, and comes in a Systainer case with core accessories. The Plus version includes the battery packs and charger. The Set version offers the same as the Plus version but with added extras and accessories. The range is available at specialist retailers now.

[www.festool.co.uk/unplugged](http://www.festool.co.uk/unplugged)



## More show news

There 's a tremendous line-up of demonstrators for the Midlands Woodworking & Power Tool Show, including Andrew Hall, Jennie Starbuck, Tony Wilson, Reg Slack, Wayne Mack, Michael Painter, Mick Hanbury, Colin Hickman, Mark Raby, Nic Westermann, Peter Tree, Bob Neill and Peter Sefton.

The show takes place at the Newark Showground, Nottingham on March 27-28, and promises to be an excellent day out with over 50 trade stands to visit as well.

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# In brief...

## More accessories

Dremel has launched a new seven-piece DSM20 compact saw accessory cutting set, a new multi-purpose router bit set and new multipurpose and EZ SpeedClic accessory sets.

The DSM20 saw kit includes cutting discs, wheels and blades for a wide range of cutting tasks, and sells for £45. The router set includes seven bits in a smart wooden storage box, and costs £34.99.

The 100 and 150 piece multi-purpose accessory sets are priced at £29.99 and £34.99 respectively. [www.dremel-direct.com](http://www.dremel-direct.com)



## More Araldite

Araldite adhesives' recently increased product range is now stocked by Decco Home & Garden outlets, and are also featured in the RS Components on-line catalogue.

Decco has added to its core Araldite offer with a range introduced earlier this year that includes Araldite Super Glue in both liquid and gel 3g tubes, plus Araldite Instant Fix, Araldite Crystal Fix and Araldite Outdoor Fix 'grab' adhesives.

The Araldite range of carded adhesives was revitalized just a couple of years ago.

[www.go-araldite.com](http://www.go-araldite.com)

## Leigh takeover

Axminster has just completed a deal which will give the company exclusive rights to sell Leigh products throughout the UK and Ireland. Leigh Industries is the most innovative and highest quality manufacturer of dovetail jigs, with a range that includes the award-winning D4R Pro, Super Jigs and the recently-introduced RTJ400 jig.

A demonstration of these machines can be arranged at any Axminster store. There is also the opportunity for customers to have their routers set up for free when they purchase a Leigh jig. For

more information about this and to book a demonstration in advance, customers are asked to contact their nearest store.

Axminster also offers a

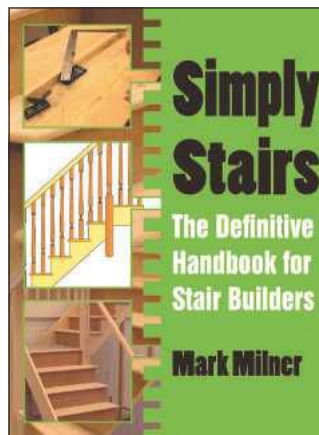


one-day introductory course to Leigh jigs in its Skill Centres in Axminster and Sittingbourne. Dates and further details about the course can be found at [axminsterskillcentre.co.uk](http://axminsterskillcentre.co.uk) [www.axminster.co.uk](http://www.axminster.co.uk)

## Three steps to heaven

*Simply Stairs* by Mark Milner (an occasional contributor to *The Woodworker*) guides the reader through all aspects of the design and construction of a wide range of timber staircases, step-by-step. It provides anyone with a basic knowledge of woodwork with the know-how and confidence to construct this most important of building elements from start to finish. The book also features the author's acclaimed 'Rise & Going Calculator' – a unique easy-to-read chart which aids stair calculations by eliminating the need for geometry and trigonometry.

The book is likely to be indispensable for students,



apprentices, college lecturers and tradespeople, and will also become the handbook of choice for all those involved with do-it-yourself and self-build projects. It costs £25. [www.whittlespublishing.com](http://www.whittlespublishing.com)

## DIARY

### FEBRUARY

#### Axminster Skill Centre courses

**19-20** Beginners woodturning

**21** Sharpening with Tormek \*

**23** Pyrography

**23-24** Beginners routing

**24** Scrollsaw course \*

\* Course held in Sittingbourne, Kent  
Unit 10 Weycroft Avenue, Axminster  
EX13 5PH

0800 975 1905

[www.axminsterskillcentre.co.uk](http://www.axminsterskillcentre.co.uk)

#### FFX Tool Show 2015

**27-1 March** Kent Event Centre,  
Maidstone ME14 3HT  
01303 852692

[www.ffx.co.uk](http://www.ffx.co.uk)

#### Record Power Road Show

**20-21** Yandles, Martock TA12 6JU  
01935 822207

[www.yandles.co.uk](http://www.yandles.co.uk)

#### West Dean College courses

**20** Turning a wooden bowl

**20-22** Turning green wood

**27** Gilding furniture and frames  
01243 811301

[www.westdean.org.uk](http://www.westdean.org.uk)

### MARCH

#### Axminster Skill Centre courses

**3** Introduction to Leigh jigs \*

**5** Turning wooden fruit

**5-6** Beginners routing

\* Course held in Sittingbourne, Kent  
Details as above

#### Record Power Road Show

**13-14** Paskins, Kidderminster DY11 7QP  
01562 829722

**14** Snainton Woodworking Supplies  
Scarborough YO13 9BG  
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#### South-East Woodworking Show

**6-7** Kent Country Showground,  
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**MANUFACTURER:** Festool

**D&M GUIDE PRICE:** See website

**FESTOOL**

Festool have released a pair of 10.8V cordless drill drivers with 2.6Ah batteries – the C-handled CXS Li 2.6 and the T-handled TXS Li 2.6. Both machines offer impressive ergonomics and low weight (0.9kg) for convenient drilling and fastening, and feature both FastFix and CENTROTEC quick tool-change chucks plus an integrated LED light and battery charge display. They have 12 torque settings and 'torque switch off' for precision fastening. They come with a right-angled elbow adapter for drilling at 90°, and two high-quality batteries.



## DEWALT 5.0Ah 6-PIECE KIT

**MANUFACTURER:** DeWalt

**D&M GUIDE PRICE:** £829.95

**DEWALT**

DeWalt have launched their first 18V 5.0Ah kit, the DCK694P3. It comprises the DCD995 XRP brushless hammer drill, the DCF886 brushless impact driver, the DCS391 circular saw, the DCG412 angle grinder, the DCS331 jigsaw, the DCL040 work light, three 5.0Ah batteries and a charger, packed in DS300 Tough System kit boxes.



## DEWALT DCL060 AREA LIGHT

**MANUFACTURER:** DeWalt

**D&M GUIDE PRICE:** £109.95 (bare)

**DEWALT**

Also new from DeWalt is the DCL060 LED XR LED area light, which has a 1,500 lumen output and a broad and even beam pattern. It's fitted with a rotatable lamp head for directional control of the light output, and is ideal for lighting work areas with no mains electricity or natural light. When fitted with a 5.0Ah XR Li-ion battery pack (available separately), it offers just over three hours runtime.



## MAKITA BRUSHLESS ANGLE GRINDERS

**MANUFACTURER:** Makita

**D&M GUIDE PRICE:** See website

**Makita**

Makita have launched a pair of 18V cordless angle grinders, the 115mm (4½in) DGA454Z and the 125mm (5in) DGA504Z, both equipped with highly enhanced brushless DC motors. A built-in controller changes the cutting speed automatically according to load conditions, enabling users to obtain high-speed rotation on light-duty applications and high torque on heavier jobs. With a no-load speed of 8,500rpm, the tools also feature anti-restart and soft start features and a slide switch that's conveniently located for one-handed operation.



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BY PETER DUNSMORE

# Sew amazing!

**This stylish cherry box was designed to take sewing requisites, but could just as well be used as a jewellery casket. It contains a matching lift-out tray with a clever design feature included in its construction**

**M**ost boxes with lids are made as a cube to begin with, and the lid is then severed from the base. This guarantees that the lid will fit the base, and also that the grain will flow through the base and into the lid. It's usual to cut the four sides from one length of timber; this ensures that the grain will flow around the corners of the box too. Obviously one corner where the ends of the board meet will not match perfectly, but if this corner is to the rear of the box it won't be particularly noticeable.

## Corner choices

Most boxes are joined at the corners with 45° mitres, but it's not always easy to cut these accurately. I prefer to use an alternative – a variation on the butt joint (see **photo 2**), made using a straight fluted router cutter and a router table (or simply the router in conjunction with a straightedge). The joint is simple to make, and at the same time leaves a corner rebate for a length of stringing that conceals the construction.

## Preparing the parts

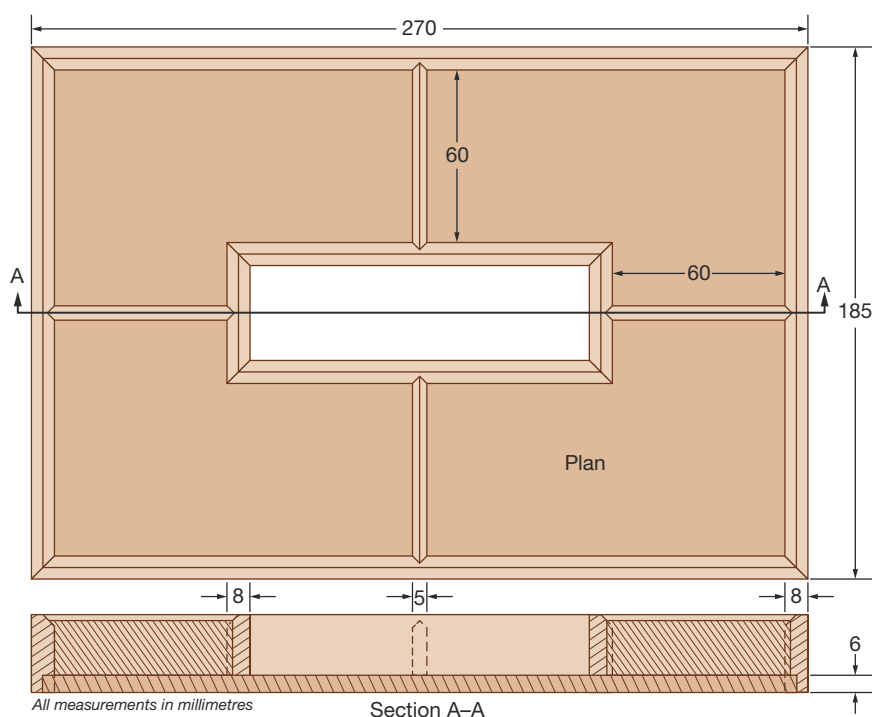
Most figured hardwood timbers would be suitable for the box so long as the timber is flat and dry. I used a piece of cherry 1200mm long and 135mm wide for the sides, and planed it to a thickness of 14mm.

Fit a straight fluted cutter to the router and cut an 11 x 6mm rebate along both long edges of the timber. Then use a square to mark out the four lengths of timber required, leaving a space of 5mm or so between pieces to allow for the thickness of the saw blade. Cut the four pieces to length and square the ends.

## Cutting the corner joints

Make a simple jig using a couple of pieces of mdf glued together at right angles, **photo 1**, and cut an 11mm square rebate at each end of the box front and back pieces. The rebates should be cut in two or three passes. Take care to cut them on the correct faces, and mark the timber carefully

**Fig 1**



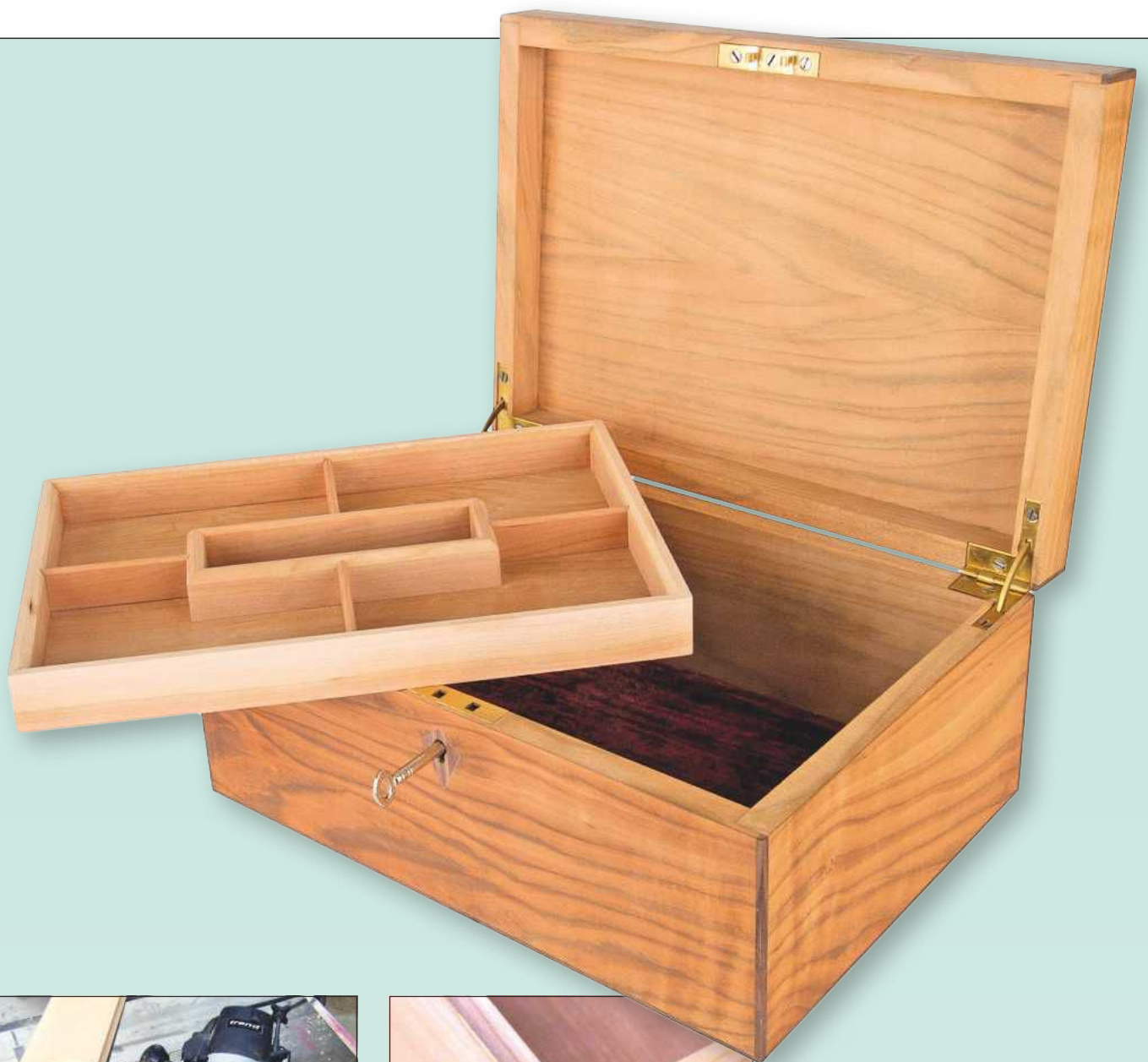
## SEWING BOX CUTTING LIST

All dimensions are in millimetres

Part	Qty	L	W	T
<b>Sides</b> (from)	1	1200	135	14
<b>Top</b>	1	350	250	9
<b>Base</b> (mdf)	1	350	250	9
<b>Tray sides</b> (from)	1	1200	30	8
<b>Tray partitions</b>	1	300	19	5
<b>Tray supports</b> <sup>1</sup>	400	20	9	
<b>Tray base</b> (mdf)	1	300	200	6

You will also need enough 3mm square walnut stringing for the edges of the box, cherry veneer to cover both sides of the tray base, some suitable material to line the base, two hinges and a box lock.





1 Make a simple router jig from two pieces of mdf fixed together at right angles



2 The assembled corner joint leaves a small rebate to take the stringing



3 Assemble and cramp up the box sides. Use softeners to protect the corners



4 Cut the book-matched top panel to suit the rebates in the box sides





Fit the lengths of stringing and hold them in place with strips of masking tape



Note how the lid is secured with shims and masking tape as the lid is separated



Stick abrasive paper to a piece of mdf and sand the sawn edges on it



Drill deep holes in the box sides to receive the ends of the hinge braces



Careful work with a sharp chisel will cut the rebate for the hinge flap



Mark the lock recess, drill out most of the waste and chisel it to shape

so that the pairs of opposing sides are equal in length. Both shorter sides are just cut square at their ends. When the sides are fitted together there should be a 3mm square rebate at the corners, **photo 2**, into which the stringing will be glued at a later stage. It's always a good idea to try a dry assembly using masking tape so that any slight adjustments can be carried out as required. Then you can cut the 9mm mdf base panel to fit the box.

### Assembling the box

Brush some pva adhesive into the rebates and assemble the box. The base will keep it square. Use masking tape and cramps to hold the four sides together, **photo 3**, and

check that the base is pushed firmly into its rebates. Avoid clamping directly over the masking tape, as it's very difficult to remove once it has been pressed into the wood. Use a damp cloth to remove any excess pva adhesive that has squeezed out on the inside of the box before it dries. Allow plenty of time for the glue to dry before removing the cramps.

### Making the top panel

I made the top panel on this box from a 25mm thick piece of cherry, split down the middle and reverse-matched to produce the mirror image seen on the lid. Begin by planing the board flat on both faces before cutting the board lengthways on the

bandsaw. Both pieces can then be glued together with a plywood tongue to reinforce the join before finishing the panel to a thickness of 9mm. Cut the panel to fit the rebates in the box sides, **photo 4**. Glue it into place, clamp it securely and put it aside to dry thoroughly.

When the box has dried, fix the stringing into the rebates on all the box edges. I planed some walnut stripwood to a little over 3mm square and glued this in place, using masking tape to hold it, **photo 5**. When this has dried, sand the walnut flush with the exterior of the box.

### Splitting the box

This part of the job always tests my nerves... yet I'm always surprised at how easy it is once I've done it. This is my method. Set the fence on the table saw to suit the height of the box lid you require, and check that the blade is set at right angles to the table. Lower the blade and clamp a piece of 12mm thick mdf flat on the table, butted up against the fence. Switch the saw on, raise the blade so it just cuts through the mdf, and set the depth of cut to 14mm.

### Safety first

The guard will have to be removed for this stage, and it goes without saying that particular care should be taken to keep your fingers away from the revolving blade. Hold the box against the fence, flat on the mdf, and slowly push it forward to cut the first side of the box.

When you've done this, slip a shim of wood into the saw cut and secure it with masking tape, **photo 6**. Then rotate the box through 90° and cut the second side. Repeat this process for the remaining sides. The result should be a clean cut on both the lid and base. The packing pieces and the tape keep the two halves together as the fourth cut is made.

You can then peel off the tape and clean off the saw marks using abrasive paper. I use double-sided tape to stick two sheets of paper next to each other on a piece of mdf, and then gently rub the box lid and base in turn over the abrasive to clean up the sawn surfaces, **photo 7**.

### Fitting the hinges

Although fiddly and time consuming to fit, quadrant hinges are probably the best type to use for boxes as the stays prevent the lid from tipping too far back. Begin by drilling deep holes in the top edge of the box sides to accept the stays, **photo 8**. Use a sharp pencil or a craft knife to mark out the shape



of the hinge on the box sides. Then chisel out each recess to a depth equal to half the thickness of the hinge knuckle, **photo 9**. Repeat this process for the lid of the hinge.

The secret of success is to ensure that the knuckle of the hinge protrudes at the rear of the box by the same amount on both the base and the lid – in this case, by half the thickness of the knuckle.

### Fitting the lock body

Now it's time to mark out the position of the brass lock. Use a drill to remove most of the waste wood by drilling a series of perpendicular holes down into the front edge of the box. Then chisel out the recess for the lock, **photo 10**. Careful measuring and the use of a small square will locate the position of the hole required to suit the pin and the key.

### Creating the escutcheon

This is made from a piece of walnut about 3mm thick which will complement the stringing around the perimeter of the box. Mark out the kite shape and the position the keyhole on a vertical line in the middle of the kite. Then use two suitably sized drill bits and a small chisel to form the keyhole, **photo 11**.

Hold the escutcheon in place on the box front and score round the perimeter of the piece with a craft knife. Remove sufficient waste to insert the escutcheon level with the box. An accurate method is to use a very small inlay router cutter – only 2mm in diameter – and to manoeuvre the router very carefully (see **photo 11** again) before using a chisel to trim the remaining waste back to the scored lines, **photo 12**. Alternatively, just cut the kite shape right the way through and fit a thicker insert!

### Fitting the lock catch

The next job is to cut the recess in the box lid to receive the lock catch. For the box to lock precisely it's important that the catch is located accurately. The method I find



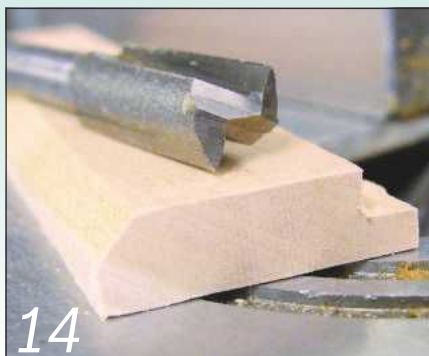
Mark out the escutcheon, cut it to shape and create the keyhole cutout in it



Use a small router cutter to form the recess and finish it with a chisel



Mark the position of the lock catch on the lid and chisel out its recess



Form a bottom rebate and a top bevel on the wood for the tray sides



Use a sharp knife to score a line on each piece where the mitre will be

easiest is to file away the two lugs on the back of the catch. Put a strip of double-sided tape on the back of the catch, fit it to the lock and turn the key to secure it. Close the lid down onto the box and press hard above the lock area. Turn the key and lift the lid, taking the catch with it. This gives you the exact location where the catch needs to be let into the wood. Mark round the catch, remove it and use a sharp chisel to cut the recess so the catch fits level with the surrounding timber, **photo 13**.

### The tray design

The lift-out tray sits on two pieces of cherry that have been cut and glued in place on the inside faces of the box sides. The tray is

a little fiddly to make, but the end result is worth the effort. In the past I've made trays with small handles or rings at the ends of the box, but for something different this time I decided to make an opening in the middle of the tray into which a hand could be inserted to lift it out.

The base of the tray is mdf covered on both sides with cherry veneer to match the box. The tray sides are 6mm thick cherry, with a rebate cut along the lower edge to receive the base and a shallow bevel formed along the top inside edge to soften its overall appearance, **photo 14**. A similar piece is made for the internal wall of the tray, which sits around an opening made in the base using a coping saw.



Sand back to the scored line with the disc sander table set to 45°



Cut V grooves to accept the dividers in the centre of each tray side



Tape the tray components together, glue the mitres and fold them up



### Mitred corners

For corner mitres to look attractive they need to be cut accurately, and I find the following method works well. Establish the lengths required by measuring the inside dimensions of the box and subtracting about 1mm from each measurement. Use a very sharp knife to score a line across the ends of the timbers, **photo 15**.

Now set the table on your disc sander to exactly 45°. To check this angle, mitre the ends of a couple of offcuts and bring them together to see if the joint is at right angles; if it's not, adjust the table angle accordingly. When you're satisfied with the setting, hold the timber against the fence and push it against the sanding disc. A small burr will appear by the score line. As soon as this falls off, **photo 16**, pull the timber away from the disc.

### Making up the tray

Mark out the centre vertical on the inside faces of each of the eight components that make up the walls. Cut a V notch using a mallet and a sharp chisel, **photo 17**, to suit a corresponding insert piece also shaped on the disc sander. Join the four walls together to form the inside and outside part of the tray.

A method I like is to lay the four pieces together end to end against a suitable straight edge and to pull some masking tight over the joins, **photo 18**. Turn this over, put a little adhesive in the mitres and fold the pieces into a rectangle; the joins will close up beautifully. The wall around the centre opening is a little trickier to make as the V notches are on the outside.

The partitions are made from 4mm thick cherry, bevelled at the ends either with a chisel or on the disc sander. A shallow bevel is cut along the top edge using a small block plane to blend the partitions into the walls of the tray.

Finish off by applying the finish of your choice. For this box I applied three coats of finishing oil and allowed this to dry. Then glue some suitable lining material into the base of the box and you're done.

### FURTHER INFORMATION

#### Brass hardware

- Restoration materials
- 0161 746 2741
- [www.restoration-materials.co.uk](http://www.restoration-materials.co.uk)

#### Router cutters

- Trend
- 01923 249911
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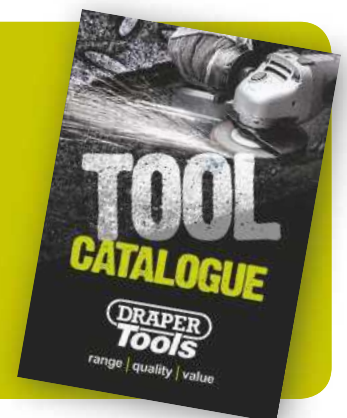


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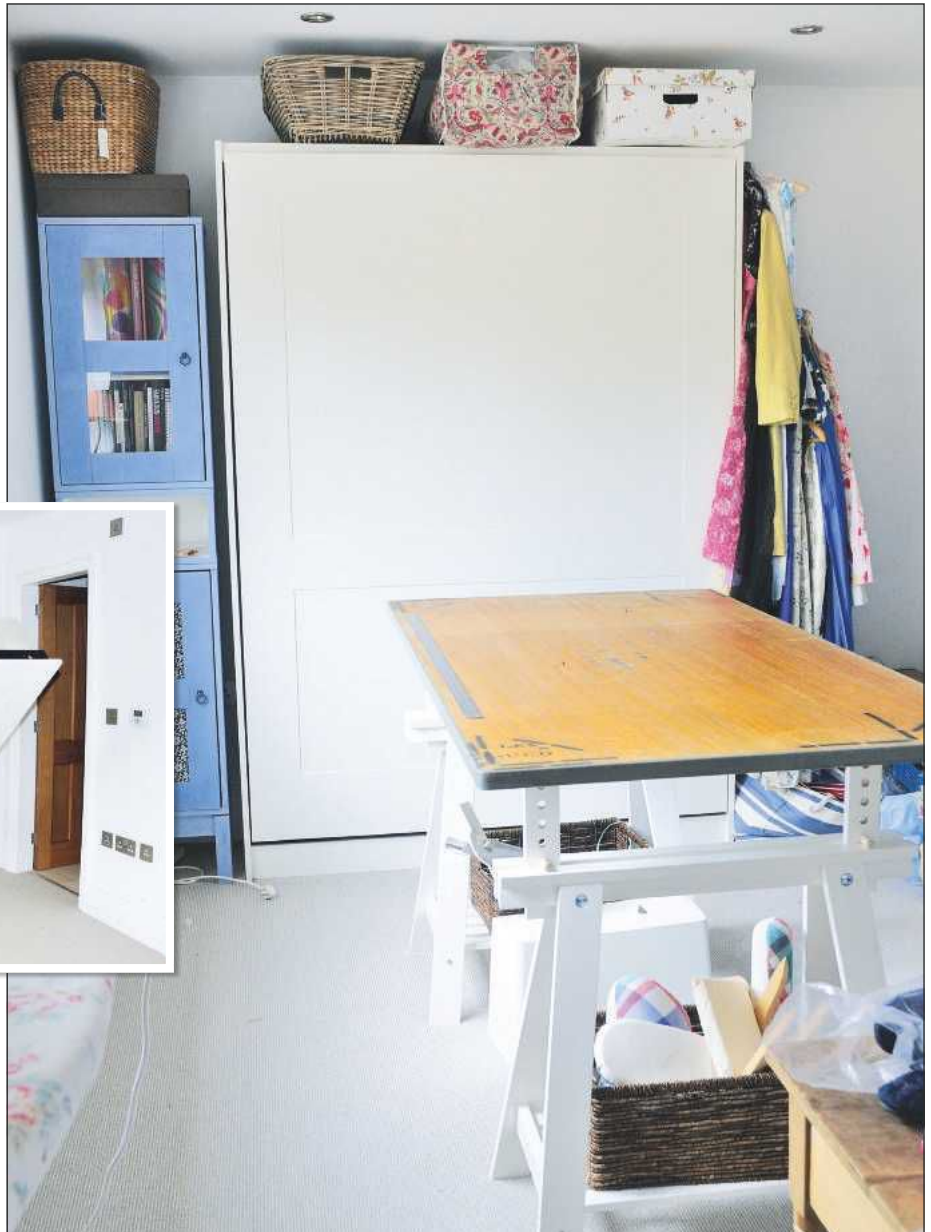
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BY KEITH SMITH

# Spot the bed!

**Space is something we're all short of, and the idea of making a room serve two purposes is not a new one. It nearly always ends up in a compromise, but here's a potential solution that really works**

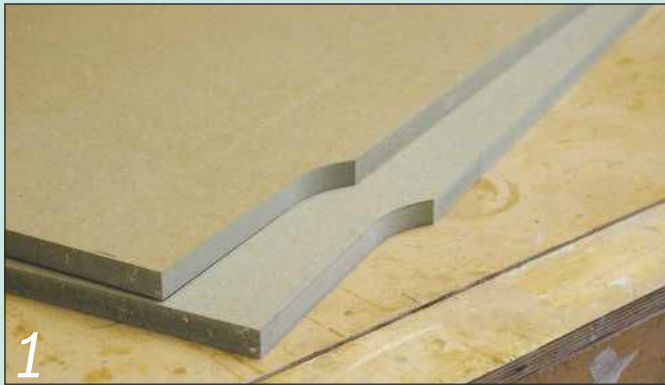
**T**ake sofa beds, for instance. The downside of using one is that it's normally in the living room, so when it's in use the main part of the house is off-limits until your guests get up. So when a customer asked how she could create a sewing room, without building an extension, I suggested fitting a hideaway bed in the spare bedroom.

She wanted a really comfortable bed that was easy to fold away. Ideally she wanted to buy her own mattress, rather than be tied to a thin one specifically designed to work with the bed, and after a search of the

internet we found a company called Hideaway Beds based in Devon, offering a range of beds which fitted the bill. It was too far to travel down to visit their showroom, so I gave them a call to ask their advice on which of their models would work best. They recommended their Alpha Bed as the most suitable for our requirements.

## **Too clever by half**

This bed kit costs £550 for a standard double bed, which includes VAT and delivery, and for that you get just two boxes of various metal components. When they



1

I prepared all the mdf parts in the workshop, starting with the side panels which featured shaped cut-outs to fit over the skirting boards



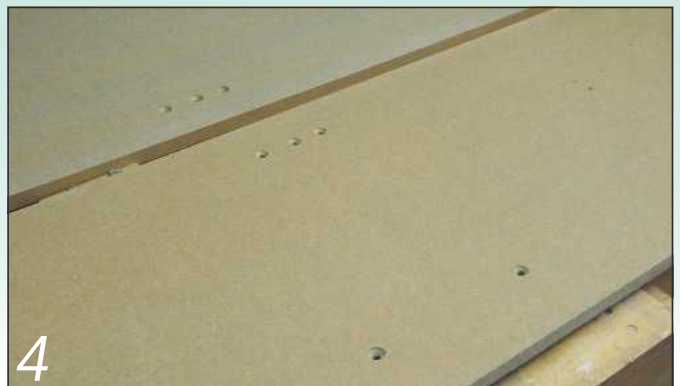
2

I biscuit-jointed the top panel to the top fascia to give it extra strength and to make alignment of the components easier



3

Marking the position of the lift mechanism on the side panels was critical, as any inaccuracies would make its assembly impossible



4

I then bored deep countersinks to house the large machine screw heads, so they wouldn't be so noticeable when the bed was assembled



5

On site I started out by assembling the outer frame where it was to be fitted

first launched the bed they had several returned when customers, thinking it was like an Ikea flatpack, bought the bed but couldn't assemble it. So now it's sold only to the trade, as it takes a degree of woodworking skill and equipment to make the housing and assemble the frame. However, they will sell the kit to competent

woodworkers if you give them a call and tell them you know what you're doing!

In reality, it's not that difficult to make a simple mdf frame and assemble the bed; it just needs a few tools, a bit of space to cut the panels to size and a degree of patience. The kit comes with a set of comprehensive instructions, written in clear English, which

makes the job much easier than trying to follow the pictorially incomprehensible set of drawings you usually get.

### Design options

Of course it's possible to make a more complicated frame and completely hide the bed in a run of units, or even to disguise it as a bookcase for instance, and the company's website has plenty of examples to spark off your creativity.

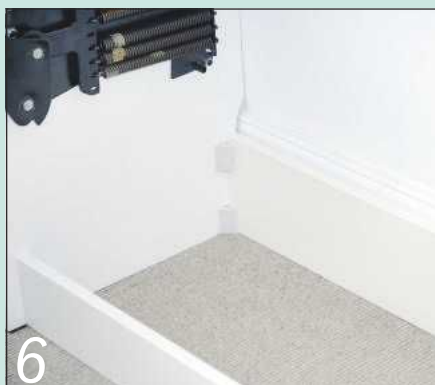
For this bed we went for the middle of the road as regards design; it has an mdf carcass which I spray-painted in the workshop, and a single-piece front panel. This turned out to be the only major problem, as it was a nightmare trying to manoeuvre this large pre-painted panel through the house and up the stairs!

### Preparing the parts

The bed consists of a simple housing; it's designed so a site carpenter can make it up on the premises and the kit comes with various brackets, so there's no need to even cut a joint. However with my customer wanting a painted finish, I cut everything in the workshop and test-assembled it there before spraying the parts.

The instructions that come with the kit





6 The rear base panel is fitted slightly forward to accommodate the skirting board



7 The number of springs counterbalances the weight of the mattress and panel



8 The heads of the fixing bolts are visible on the outside face of the side panels



9 It was easier to have a single front panel as the metal bed frame was bolted together section by section...



10 ...but I had to buy some shorter screws that wouldn't penetrate the face of the panel to fix the cross braces in place

include a full cutting list for the various bed size options. All the panels are cut from 18mm thick mdf.

The instructions recommend making four panels for the front of the bed in order to make it look like two pairs of wardrobe doors, but my customer wanted a single panel (measuring 1964 x 1460mm) as she intended to fit a large magnetic noticeboard extending almost the full width of the bed. Thankfully, the beauty of this kit is that you're not really constrained at all over the final look of the unit.

### Workshop operations

After cutting the side panels to size, I used a router cutter to form the cut-outs over the skirting boards, **photo 1**. The kit comes with brackets which allow simple assembly, but I biscuit-jointed some joints – to attach the top panel to the top fascia, **photo 2**, for example.

The next step was to mark out for the position of the lift mechanism on the side panels, **photo 3**; it was absolutely critical to get this right. I then bored deep countersinks on the outside of the panels to house the large machine screws which will attach the lift mechanism, **photo 4**. Finally, I cut biscuit slots in the side panel to help fix and locate the various parts of the bed frame.



11 Access to the screws was awkward in places; using two hex bit holders in line helped

### Starting the installation

I assembled the mdf frame in the room where it was to be fitted, **photo 5**. The room has tall skirting boards, and I had previously created cut-outs in the side panels to clear them. At this stage it's rather wobbly, but it's extremely important to get it square before attaching it to the wall. I found it was best at this stage to just fix it to the wall loosely (but securely) with a couple of brackets, ideally ones that allow a bit of adjustment.

In **photo 6** you can see the cut-outs in the side panels abutting the skirting board.



12 Once the metal frame was attached, the short arm of the lift mechanism was angled forward

The base panel has been fitted slightly forward to accommodate the skirting board, but there was still plenty of clearance between it and the mattress.

### Adding the lift mechanism

The lift mechanism comes with a number of springs, **photo 7**. After reading the instructions I made an educated guess as to which ones to fit to counterbalance the weight of the mattress and panel I was intending to use. It is possible to alter the springs once the bed is fitted, but this time I was fortunate in



Despite my careful positioning of the frame, the bed did not fit perfectly squarely to start with



Next, I fitted the mattress and added the cover plates which hide the mechanism



The angled headboard prevents pillows from falling down behind the bed



that, for once, I guessed right!

One thing I hadn't initially realised (although it makes perfect sense when you take into account the loads that the lift mechanism has to cope with) is that the fixing bolts are visible on the outside face of the side panels, **photo 8**. This wouldn't matter if the bed was to be built into a run of units, but as a stand-alone unit they were going to show unless a decorative panel was

fitted over each side of the bed frame. That said, mine were neatly countersunk into the side panels, and in the end my customer chose to leave them on view rather than lose any more space along the wall.

### Assembling the frame

It was probably easier at this stage to have the single front panel as the metal frame for the bed was bolted together, **photo 9**.

However, this is when things became a little bit trickier. If we had fitted the four 'doors' recommended in the instructions, I would have had eight stiles to screw into, but with my single door I had to screw the metal cross braces to the centre of the thin panel, **photo 10**. This meant a trip out to the ironmongers to get some shorter screws to ensure they didn't show on the front face.

Access to the screws was a bit awkward in places, and I found using two hex bit holders in line helped, **photo 11**. A power driver is vital as there are a lot of screws to drive...

Once the metal frame was firmly fixed to the panel, I positioned the lift mechanism so the short arm was angled forward, **photo 12**. The bed frame was then slotted onto the lift mechanisms and a single bolt fitted to each side. This was definitely a two-person job!

### Final adjustments

Despite all my careful initial positioning of the frame the bed did not fit perfectly squarely, **photo 13**, and I had to fit a couple of packers under the sides and reposition the top of the frame slightly to one side to get it to fit perfectly.

Once the panel was fitted squarely within the frame, I installed the mattress onto the bed; without its weight the bed will swing up alarmingly quickly. At this point it may be necessary to adjust the springs so the bed swings up and down with little effort. I think this would be quite a tricky job, and I was very relieved when I found that I'd guessed correctly with the spring settings. Once I was happy that the springs were set in balance, I fitted the cover plate that hides the mechanism, **photo 14**.

The angled headboard prevents pillows from falling behind the bed and also helps to brace the two side panels, **photo 15**. If you felt inclined you could make this far more decorative, so long as it cleared the bed when it was folded up. The kit comes with a pair of fold-down feet which help to keep the mattress in place when the bed is folded up, as you can see in the final photo.

My customer has been using the bed for a few months now, and has found it very easy and convenient to use. It's still awaiting its magnetic noticeboard though, as she hasn't yet plucked up the courage to drill into the pristine front panel!

### FURTHER INFORMATION

- Hideaway Beds Ltd
- Plympton, Devon PL7 4JH
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# MT55CC The Ultimate Plunge Saw System

With pre-scoring function

**mafell**

Quality • Innovation • Performance • Beyond all expectation



**MT55cc**  
Precision Plunge Saw  
c/w 2x Rail Kit  
**£639.95**  
INC VAT  
**SAVE**  
**£298.62**  
INC VAT

Prices  
held until  
**28th Feb**  
2015 prices  
valid from  
1st March



For extended rail use two guide rails, which can easily be fitted together with the connection piece.



The MT 55cc works with or without a rail - simply turn the pointer to show the exact cutting depth.



Mafell offers the fastest blade change worldwide. Simply press the release button and lift the lever.

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AGENCIES LTD

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**TABLE SAWS**  
CTS100

**LEG STANDS AVAILABLE FOR CTS11 & CTS100**  
£22.99 EX VAT  
£27.59 INC VAT

**FROM ONLY**  
**£69.99**  
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**INCLUDES LEFT & RIGHT TABLE EXTENSION**

**Clarke**  
**4" BELT/ 6" DISC SANDER**

**CS4-6D**  
**£84.99**  
EX VAT  
**£101.99**  
INC VAT



**Clarke**  
**6" BELT/ 9" DISC SANDER**

• Includes stand  
• 1 Hp/ 230v/ 1ph motor

**CS6-9C**  
**£199.99**  
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**Clarke**  
**1" BELT & 5" DISC SANDER**

• Inc. 2 tilt/lock tables and mitre gauge  
• 300w motor

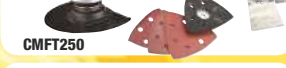
**CBS1-5**  
**£59.99**  
EX VAT  
**£71.99**  
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• Great for sawing, cutting, sanding, polishing, chiselling & much more  
• 250w motor  
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\*Black & Decker

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**CBS250 INCLUDES STAND**

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**BLACK & DECKER**

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Einhell RT - PLB2 850w 3mm £49.98 £59.98  
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\*Was £65.99 inc.VAT

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• Powerful, bench mounted disc sander • 900W  
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• Dimensions (LWH): 440x437x386mm  
• Weight: 28kg

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**Clarke** **CONTRACTOR 18V PRO CORDLESS DRILL/DRIVERS**

• 10mm chuck size  
• 2 Speed, Variable control - 0-350/0-1250rpm  
• 21 torque settings

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**Clarke** **SHEET SANDERS**

**CON300**  
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INC VAT

\*110V in stock

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**SUPPLIED WITH ROBUST STEEL STAND**

• Large 350mm turning capacity • Variable speed  
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• 5700Rpm No Load Speed  
• Laser Guide for accurate cutting  
• With folding legs and wheels - Large 930 x 640mm Table

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**Clarke** **13" MINI WOOD LATHE**

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• 325mm distance between centres • 200mm max. turning capacity (dia) • 0.2Hp motor

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**Clarke** **QUICK RELEASE ALUMINIUM SASH CRAMPS**

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CHT375 900mm £7.99 £9.99  
CHT376 1200mm £9.99 £11.98

**Clarke** **BELT SANDERS**

• Ideal for surface removal, sanding and finishing

**Clarke** **ABRASIVE SANDING BELTS IN STOCK**

**BS1**  
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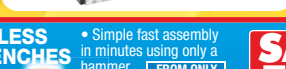


**MODEL WATT M/MIN EX VAT INC VAT**  
Clarke BS1 900w 380 £29.98 £35.98  
Clarke CBS2 1200w 480 £69.98 £83.98  
Makita 9911 650w 75-270 £94.99 £113.99

**Clarke** **BISCUIT JOINER**

• 860W Motor  
• 11000rpm Operating Speed  
• 14mm Cutting Depth

**BJ900**  
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**£34.99**  
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**Clarke** **DRILL BIT SHARPENER**

• Great for 3mm to 10mm HSS drill bits • 70W motor  
• Drill bit guide ensures sharpening at the correct angle  
• Saves cost of new drills

**CBS16**  
**£21.99**  
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• Max thickness capacity 130mm  
• Planing depths adjustable from 0-2.5mm  
• Powerful 1250w motor  
• 8000rpm no-load speed

**CPT250**  
**£179.99**  
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**Clarke** **PLANERS & THICKNESSERS**

• Ideal for DIY & Hobby use • Dual purpose, for both finishing & sizing of timber (CP-6 planer only)

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**MODEL MOTOR MAX THICK. EXC. VAT INC. VAT**  
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CPT800 1250w 120mm £169.98 £203.98  
CPT600 1250w 120mm £189.98 £227.98  
CPT1000 1500w 120mm £269.98 £323.98

**Clarke** **WOODWORKING LATHES**

• Ideal for enthusiasts/hobbyists with small workshops  
• 325mm distance between centres • 200mm max. turning capacity (dia) • 0.2Hp motor

**CWL1000**  
**£239.99**  
EX VAT  
**£286.99**  
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**Clarke** **3 PCE CHISEL SET INCLUDED WITH CWL1000**

**£114.99**  
EX VAT  
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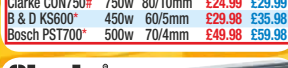
**MODEL CENTRE TO TURNING EXC. VAT INC. VAT**  
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**Clarke** **BOSCH POWER TOOLS**

**JIGSAWS**

\*DIY #Professional

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• Tables tilt 0-45° left & right  
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B=Bench mounted  
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EX VAT  
**£33.99**  
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• For sanding & polishing  
• 125mm diameter sanding discs  
• 4000-11000 opm

**INC 5 DISCS**



**Clarke** **BOLTLESS SHELVING BENCHES**

• Simple fast assembly in minutes using only a hammer

**FROM ONLY**  
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WHEN YOU BUY ANY MAX OF 5 FROM THIS RANGE SAVE AT LEAST £17.99 INC.VAT

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RED, BLUE, BLACK, SILVER & GALVANISED STEEL

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**150 KG** (evenly distributed) Strong 9mm fibreboard shelves  
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• Ideal for enthusiasts/hobbyists with small workshops  
• 325mm distance between centres • 200mm max. turning capacity (dia) • 0.2Hp motor

**CWL1000**  
**£239.99**  
EX VAT  
**£286.99**  
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**Clarke** **3 PCE CHISEL SET INCLUDED WITH CWL1000**

**£114.99**  
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**MODEL CENTRE TO TURNING EXC. VAT INC. VAT**  
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**Clarke** **3 PCE CHISEL SET INCLUDED WITH CWL1000**

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• 325mm distance between centres • 200mm max. turning capacity (dia) • 0.2Hp motor

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**£2**



**Clarke**  
**MORTISING MACHINE**  
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• Accurately creates deep square recesses • Table size 150 x 340mm  
• Maximum chisel cap. 76mm • Robust cast iron base & column ensures stability & accuracy • 95mm depth of cut

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**CHISELS AVAILABLE FROM**  
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**Record W77**

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Clarke CHT152	Bolted	150/152/61	£13.49	£16.19
Stanley Multi Angle	Clamped	72/60/40	£16.99	£20.39
Record V75B	Clamped	75/50/32	£18.99	£22.79
Clarke W77	Bolted	180/205/78	£24.99	£29.99

**Clarke** **10" SLIDING MITRE SAW**  
• For fast, accurate cross, bevel & mitre cutting in most hard & soft woods  
• 1800w motor  
• Laser guide  
**£129.99** EXC. VAT **£155.99** INC. VAT  
CMS10S2

**MITRE SAWS**  
**Makita**  
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Quality Range of Mitre saws and blades available  
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Fury 3 210/25.4 60/200mm £119.98 £143.98  
Einhell 250/30 75/340mm £159.98 £191.98  
TH-SM2534 260/30 95/130mm £199.98 £239.98  
S1040

**Clarke** **DUST EXTRACTOR/CHIP COLLECTORS**  
**£119.98** EXC. VAT **£143.99** INC. VAT  
METABO ALSO AVAILABLE

• Powerful 750w motor  
• 56 litre bag capacity  
• Flow rate of 850M<sup>3</sup>/h

MODEL	MOTOR	FLOW RATE	BAG CAP.	EXC. VAT	INC. VAT
CDE35B	750w	850 M <sup>3</sup> /h	56Ltrs	£119.98	£143.98
CDE7B	750w	850 M <sup>3</sup> /h	114Ltrs	£139.98	£167.98

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20 GREAT STYLES IN STOCK  
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11.8KW  
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6.9KW  
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CWS200  
• Produces accurate razor sharp cutting edges on chisels, scissors, tools etc  
• 120w motor  
• Grinding disc 200mm  
• Wet bath • Leather honing wheel  
**£109.98** EXC. VAT **£131.99** INC. VAT

**Clarke** **MITRE SAW STAND**  
CFMSS1  
**£64.99** EXC. VAT **£77.99** INC. VAT  
• Suitable for most sizes/makes of saw  
• Inc. outriggers & rollers

**Clarke** **ROTARY TOOL KIT**  
CRT40  
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Kit includes:  
• Height adjustable stand with clamp  
• Rotary tool  
• 1m flexible drive  
• 40x accessories/consumables

**Clarke** **DUST EXTRACTOR**  
CDE1000  
• 50 litre tank capacity  
• 183 m<sup>3</sup>/h flow rate  
• 1000W input wattage  
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**Clarke** **CIRCULAR SAWS**  
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6" & 8" AVAILABLE WITH LIGHT  
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• Includes bench dogs and guide holes for variable work positioning • 2 Heavy Duty Vices  
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• LxWxH 1520x620x855mm  
CHB1500  
**£129.98** EXC. VAT **£155.99** INC. VAT

**Clarke** **TABLE SAW WITH EXTENSION TABLES (250mm)**  
CTS14  
• Ideal for cross cutting, ripping, angle and mitre cutting  
• Easy release locking mechanism for table extensions • 0-45° tilting blade • Cutting depth: 72mm at 90° / 65mm at 45°  
• 230V/50Hz, Motor: 1800W  
No load speed: 4700rpm  
Shown with optional leg kit  
CLKS £22.99 exc. VAT £27.59 inc. VAT

**Clarke** **ROUTERS**  
BOSCH  
CR1C  
FROM ONLY **£39.98** EXC. VAT **£47.98** INC. VAT  
ACCESSORIES IN STOCK

MODEL	MOTOR PLUNGE (W)	EXC. VAT	INC. VAT
CR1C	1200 0-50	£39.98	£47.98
Bosch	1400 0-55	£74.99	£89.99

POF1400ACE

**Clarke** **CONTRACTOR CR2 ROUTER**  
• Powerful heavy duty machine ideal for trade use  
• Variable speed control from 7,400-21,600 rpm • 2100w motor • 0-60mm plunge depth. CR3 Router with 15 Piece Bit Set also available only £94.99  
£113.99  
INCLUDES 15 PIECE SET WORTH OVER £20

**Clarke** **ROUTER TABLE**  
CRT-1  
Router not included  
**£56.99** EXC. VAT **£68.99** INC. VAT  
• Converts your router into a stationary router table • Suitable for most routers (up to 155mm dia. Base plate)

**Clarke** **5PCE FORSTNER BIT SET**  
• Contains 15, 20, 25, 30 & 35mm bits • Titanium nitride coated for improved cutting finish  
CHT365  
**£9.98** EXC. VAT **£11.99** INC. VAT

**Clarke** **TABLE SAW WITH EXTENSION TABLES (250mm)**  
CTS14  
• Ideal for cross cutting, ripping, angle and mitre cutting  
• Easy release locking mechanism for table extensions • 0-45° tilting blade • Cutting depth: 72mm at 90° / 65mm at 45°  
• 230V/50Hz, Motor: 1800W  
No load speed: 4700rpm  
Shown with optional leg kit  
CLKS £22.99 exc. VAT £27.59 inc. VAT

**Clarke** **SCROLL SAWS**  
FROM ONLY **£64.99** EXC. VAT **£77.99** INC. VAT  
• 120w, 230V motor • 50mm max cut thickness  
• 400-1,700rpm variable speed • Air-blower removes dust from cutting area  
CSS16V  
MODEL MOTOR SPEED RPM EXC. VAT INC. VAT  
CSS400B 85w 1450 £64.99 £77.99  
CSS16V 120w 400-1700 £79.98 £95.98  
CSS400C 90w 550-1600 £99.98 £119.98  
Includes flexible drive kit for grinding/polishing/sanding

**Clarke** **ROUTER TABLE**  
CRT-1  
Router not included  
**£56.99** EXC. VAT **£68.99** INC. VAT  
• Converts your router into a stationary router table • Suitable for most routers (up to 155mm dia. Base plate)

**evolution** **255mm MULTI-PURPOSE TABLE SAWS**  
FURY 5 ONLY  
**£149.98** EXC. VAT **£179.99** INC. VAT  
WAS £191.98 INC. VAT

MODEL	MAX DEPTH CUT	TABLE SIZE (mm)	EXC. VAT	INC. VAT
FURY5	54mm	73mm	£149.98	£179.98
RAGE5	55mm	79mm	£269.00	£322.80

• FURY power: 1500w (110V available)  
• RAGE power: 1800w/230V (110V available)  
table extensions included  
• was £191.98 inc. VAT • was £334.80 inc. VAT

**Clarke** **5PCE FORSTNER BIT SET**  
• Contains 15, 20, 25, 30 & 35mm bits • Titanium nitride coated for improved cutting finish  
CHT365  
**£9.98** EXC. VAT **£11.99** INC. VAT

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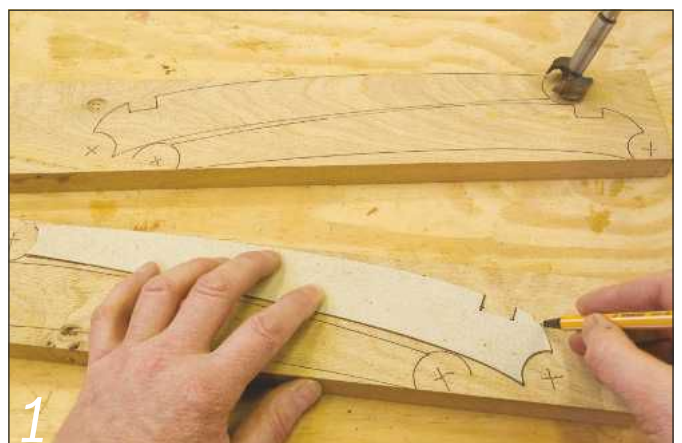


# Garden comfort

**Take some of the strain out of those garden chores with Ben Russell's stylish and ingenious kneeler/stool combination**

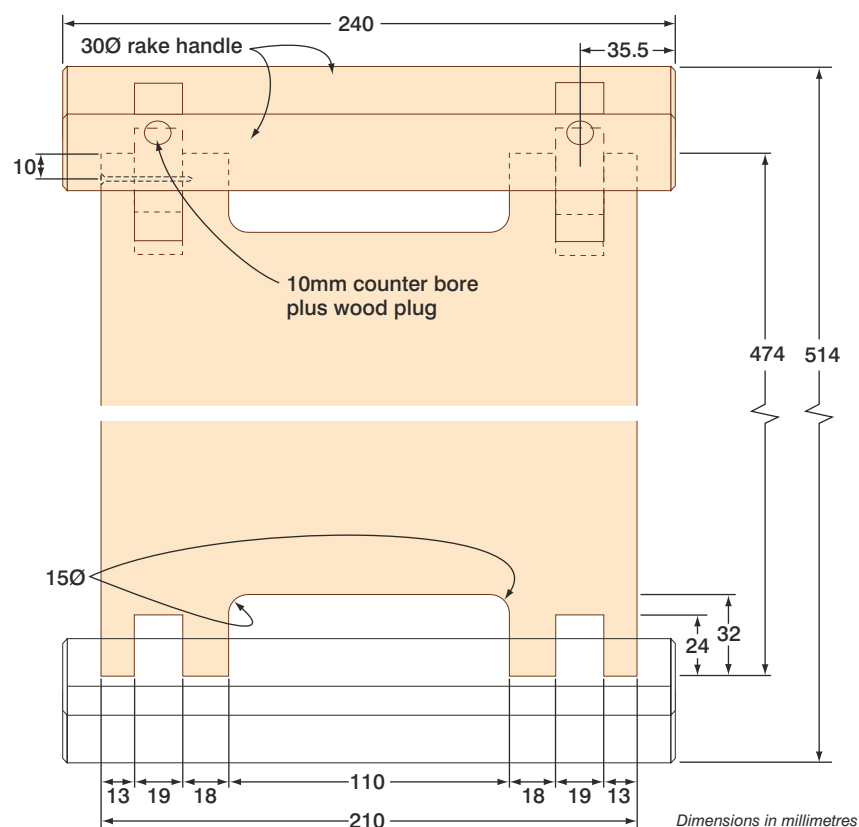
**N**ow the gardening season is fast approaching, we'll all have to reactivate some muscles we've forgotten about over the winter! When I was a bit younger, I hardly noticed the prolonged periods of squatting or crouching that are often required to keep everything in the garden in shape. These days I'm more liable to stiffen up (or put certain jobs off!) if there's too much discomfort involved.

I made this kneeler/stool for my wife, who does far more gardening than I'll ever do, and I hope she'll get a lot of use out of it. One way



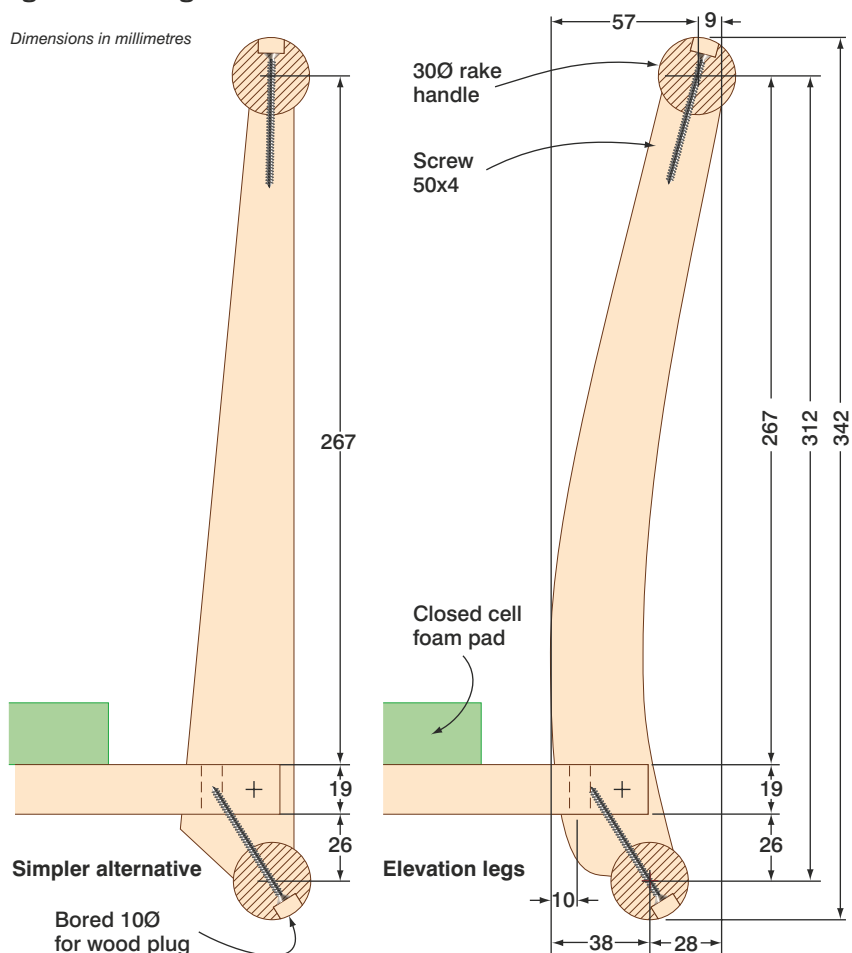
When setting out the legs with the template, allow space for the 30mm diameter holes that will be bored at each end to produce a snug fit with the rake-handle grips

**Fig 1 Plan of stool**



**Fig 2 Kneeler leg details**

Dimensions in millimetres



The radiuses at the ends of the legs can be sawn, but will need less cleaning up if you can drill them. A Forstner bit in a drill press is ideal



Cut the legs to shape with either a bandsaw or a jigsaw. The former is more likely to produce square sides, but you'll need to fit a fairly narrow blade

## GARDEN KNEELER CUTTING LIST

All dimensions are in millimetres

Part	Qty	L	W	T
Seat	1	474	240	19
Legs*	4	350	50	19
Feet/grips	4	240	30 dia	

Use 40 x 19 wood for straight legs



Clamp the legs together when shaping and smoothing them so they match. I planed the outer surface, then used 80 and 120 grit abrasive to shape the radiused top



## Did you know?

Spokeshaves can have flat or radiused soles. The flat-soled versions are used on external curves, or very gentle internal curves, while the radiused version is perfect for tighter internal curves. While the mouth openings can't be adjusted like a plane, metal shims can be placed under the blade to reduce the opening for finer work, or to cut difficult grain. Compare the gap on the left, which is shimmed, to that of the sliver-handled spokeshave on the right, which isn't.



## Tech tip

Like every other edge tool, spokeshaves do their best work when the cutting edges are very sharp. It's worth making a broad handle with a notch in the end to hold the comparatively short blade securely when you're sharpening it with a bench stone. A Tormek wet grinder has a clever jig that clamps the blade in place at a constant angle, making the sharpening process very easy and quick to carry out. The water-soaked stone keeps the edge of the blade cool during the grinding process, to ensure that the metal isn't softened by overheating. The second wheel is surfaced with leather which, with its dressing of polishing paste, is used to hone the edge to super-sharp condition.



I used two spokeshaves to clean up the inside curves: mostly a flat-soled one, but I also needed one with a curved sole to smooth the tighter radius at the top



Mark out the leg notches carefully – ideally with a marking knife, for accuracy. This small Veritas saddle square is a convenient tool to use where a larger square would feel cumbersome



Use a mortise gauge set to the thickness of the legs to mark out the housings on the seat into which they locate. File its points to score more distinct and accurate grooves

up, it's a sturdy low stool; the other way up it's a kneeler with cushioning for the knees and grips that can provide support to older gardeners while they lower themselves into place or get back on their feet.

## Design considerations

The kneeler looks quite elegant, either way up. Interestingly, this arises almost entirely from functional considerations. The ideal

6

Clean up the radiuses on the legs with coarse abrasive wrapped round a foot/grip offcut. Do each pair together, and check that the ends are square to ensure a tight fit



There are several ways to cut the notches in the legs. I used a bandsaw, then cleaned the sides with a chisel. The bottom of the cut isn't seen and needs minimal cleaning

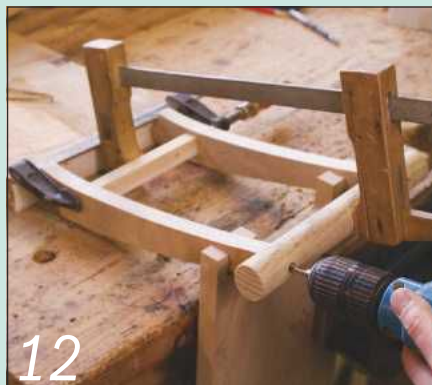


With a little care, you can set up a table saw with a cross-slide to cut the leg housings and also to saw up to the holes drilled to help form the cutouts at each end of the seat

specification included a range of ergonomic considerations: an appropriate height and width; light weight; robust construction; stability, and ease of handling. It should be a pleasure to use, starting with picking it up and carrying it to wherever it's needed. The graceful splay on the legs gives more stability to the stool, while also making the kneeling area less restricted than it would be with straight legs.



11 Make a simple jig to hold the grips while you drill them. The jig runs against a back fence, ensuring that the holes are drilled centrally. Drill a 10mm diameter x 10mm deep hole to take the plug, then a 4mm clearance hole for the screw



12 An easy way to keep the legs parallel while the grips are fitted is to place them in the seat housings, and to cramp a spacer at the other end. The grip can then be cramped in position while you drill the 3mm pilot hole for the screw



13 The seat feels better if the edges and the central notches at each end are radiused. A 6mm radius cutter with a bearing guide makes this an easy task. Non-slip matting on the bench holds the timber without the need for clamps



14 When the legs and grips are assembled, check that the notches fit. Cut plugs from 10mm dowel rod and chamfer one end to help them go in smoothly



The dimensions used here are right for my wife and me, who are of fairly average build and height. Someone carrying a bit of weight might choose to make the seat and legs a little broader.

Finally, the materials have to suit the function: they must be strong but not too heavy, and durable enough to survive casual handling and inevitable soaking. I used chestnut for the seat and legs, and recycled a broken rake handle for the feet/grips. The kneeler pad is a cut-down garden kneeler – available very cheaply from garden centres – made of closed cell foam, so it won't absorb water, and is stuck to the underside of the seat.

### Assembly notes

The seat has three notches cut at each end. The outer two are housings for the leg assembly, and the middle one gives hand clearance around the grip. The edges of the seat can be radiused with a router, or chamfered by hand; likewise the central notches at each end.

The curved legs are cut from broader 50 x 19mm wood, and the key to success is to make an accurate template by enlarging the pattern in the drawing. The curves present a few challenges, and beginners should probably stick to the straight alternative in the drawing, which is both easier to mark out and to cut and finish. The radiuses at each end can be formed very simply if you have a 30mm drill bit (and leave some spare material); otherwise cut them with a bandsaw or jigsaw. For convenience and accuracy, the alternative straight legs can be notched for the seat joint before they're shaped.

The four feet/grips are drilled for screws and counter-bored so that the screw heads can be sunk and plugged with 10mm dowel. If you have a pillar drill, it's worth making a simple jig (see **photo 11**) to help you drill the holes accurately.

Bearing in mind that the kneeler will get left out in the rain, assemble it with polyurethane glue that's both waterproof and gap-filling.

### FURTHER INFORMATION

#### Forstner bits

- Axminster Tool Centre
- 03332 406406
- [www.axminster.co.uk](http://www.axminster.co.uk)

#### Tormek grinding system Veritas saddle square

- BriMarc
- 03332 406967
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Precisa 4.0 P-1	Professional	Inc 1.4m STC + TLE (ditto)	3.5 / 5.2	87 mm x 800 mm	£1775.00	£2130.00
Precisa 4.0 P-2	Professional	Inc 1.4m STC + TWE + TLE (ditto)	3.5 / 5.2	87 mm x 800 mm	£1980.00	£2376.00
Precisa 6.0 P-1	Professional	Inc 2m STC + TLE (ditto)	4.0 / 6.5	110 mm x 1400 mm	£2416.67	£2900.00
Precisa 6.0 P-2	Professional	Inc 2m STC + TWE + TLE (ditto)	4.0 / 6.5	110 mm x 1400 mm	£2590.00	£3108.00
Precisa 6.0 VR P-1	Professional	Inc 2m STC + TWE + TLE + scorer (ditto)	4.0 / 6.5 + HP scorer	110 mm x 1400 mm	£2890.00	£3468.00

STC = Sliding Table Carriage, TWE = Table Width Extension, TLE = Table Length Extension.

Scheppach Precisa 3.0 is designed by scheppach in Germany but made in China where scheppach resident engineers oversee manufacturing quality control. Precisa 3.0 has the same warranty as Professional Series. Scheppach machines have been sold and serviced in the UK by NMA since 1972. Go to [nmatools.co.uk](http://nmatools.co.uk) and see what users say about NMA unprecedented service.





BY ANDY STANDING

# Mitre magic

**Mitre joints can be some of the most troublesome woodworking joints. They look very attractive when cut well, but inaccuracies can cause them to gape open. Here's how to get them just right**

**M**itre joints appear in many forms, ranging from the simple version with both components cut at 45° to meet at a right angle to the more complex joints needed for shapes such as octagons where the mitre angle must be carefully calculated – see the panel, right.

The joint allows two components to be assembled without showing any end grain. It's a vital joint when making up moulded frames as it lets the moulding's profile flow through the joint without distortion. It's a

## CALCULATING MITRE ANGLES

This is done by dividing 360° by the number of sides your project has and then halving the result. Here's how to calculate the mitre angles for a hexagon.

- Divide 360 by the number of sides;  
 $360 \div 6 = 60$
- Halve this figure;  $60 \div 2 = 30$
- Therefore the mitre angle required is 30°

demanding joint to cut, as even the smallest inaccuracy shows up as an open joint.

Mitres are extensively used in joinery, though never on the internal corners of skirting boards. The reason for this is that invariably the timber shrinks after jointing, causing the inside of the joint to open and show a marked gap. These joints should always be scribed. Whenever you can, strengthen your mitre joints with tongues or biscuits; this also makes them considerably easier to glue up and assemble.

## MITRING A FRAME



**1** Mark out the 45° cutting angles on the two components using a mitre square



**2** Make the cut on both parts. A mitre saw is the most accurate way of doing this



**3** Bring the components together and mark the biscuit position across the joint



**4** Set the jointer to position the biscuit centrally in the thickness of the timber



**5** Apply some pva glue to the biscuit and insert it fully into one of the slots



**6** Glue the mating surfaces of the components and bring the joint together: perfection!



## MITRING A SKIRTING BOARD



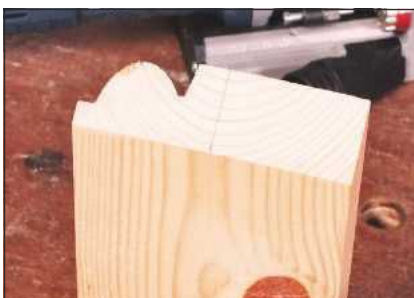
**1** Use a mitre square to mark the position of the corner mitre on the workpiece



**2** Extend the line onto all faces so you can line up the cut with your saw blade



**3** Clamp the workpiece securely in position on the saw table and make the cut



**4** Insert a biscuit to strengthen the joint. Mark its position on both parts



**5** Cut the slot close to the inside edge on each part and insert the biscuit into one slot



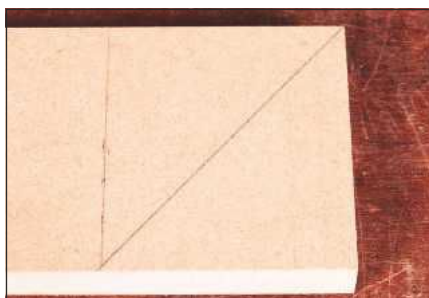
**6** Apply glue to the mating surfaces and assemble the external corner joint

## MITRING UNEQUAL WIDTHS

If the two pieces to be joined are not the same width, the mitre angle will not be 45°, even if they are to be joined at a right angle. You have to work out the angle, but this is quite simple.



**1** Mark the width of one piece on the end of the other, using a try square for accuracy



**2** Mark the diagonal. This is the angle of the mitre you need to cut on the first part



**3** Use a sliding bevel to take the angle. This is the mitre angle for the second part



**4** Transfer the angle from the sliding bevel to the mitre saw and make the cut



**5** Re-set the sliding bevel on the second piece, transfer the angle to the saw and make the cut



**6** Assemble the right-angled joint, after adding a biscuit if you need extra strength



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BY IAN TAYLOR

# British bulldog

**My son had been requesting a coffee table for some time, but I was always a bit sceptical about the design he had in mind. He wanted a low table with a shelf, looking as if it had been hewn from a solid slab of timber – the coffee table equivalent of the British bulldog: four-square, thick-set and immovable. So I eventually gave in! I think the end result proves he was on the right lines...**

**T**his is a really quick project to make. There are no conventional joints; the legs and matching spacers are simply butt-jointed to the top and shelf. Given the huge area of contact at each joint, the butt joints are more than strong enough. However, accuracy is important so I used my Joint-Genie dowelling jig to ensure the alignment was perfect.

This design works better in a timber that doesn't have a very marked figure, because then the legs and spacers tend to blend together with the shelf and top. I chose utile, which has a subdued figure and a rich brown colour when it's finished.

Work started with the boards for the top and shelf panels, which will both measure 945 x 475 x 25mm when prepared. I had in

stock a couple of long utile boards 305mm wide and about 32mm thick, which would be ideal for the top and shelf panels.

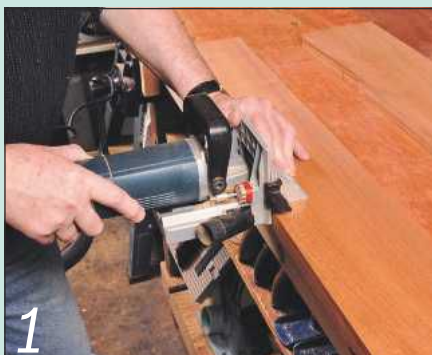
I'd hoped to be able to get away with a single butt joint for each panel, but there was a small amount of twist on the boards so I ripped them down the middle to minimise the loss of thickness in squaring them up. If you're careful in re-joining two ripped boards, you can get a seamless end product with virtually invisible joints. I used biscuit joints every 250mm or so to help maintain alignment of the panels during the gluing stage, **photo 1**.

I glued the top and shelf up in two stages, first re-joining the ripped, squared and thickened boards, **photo 2**, then gluing these up in pairs to give the full-width

panels, **photo 3**. The timber for each panel came from a single board to ensure a good colour match.

The panels needed cleaning up after the gluing stage – a little bit of levelling of the surface, followed by squaring up and matching the size of the top and shelf. Flattening up a panel is best done by planing diagonally across the face, first parallel to one diagonal, **photo 4**, then changing direction and planing parallel to the other. A finely tuned bench plane helps.

Once I was happy with the flatness on both sides, I trimmed the top and shelf to size and fine-tuned them to exactly the same dimensions. Since they're joined by rectangular blocks at the corners, both components need to be precisely matched



**1** Biscuit joints positioned every 250mm or so help to align the boards during glue-up



**2** I use an artist's palette knife to spread the pva adhesive evenly on the board edges



**3** I clamped up the boards in pairs first, then paired up the pairs to make up the full-widths





4

Diagonal planing is the best way to flatten the glued-up panels and remove any squeeze-out



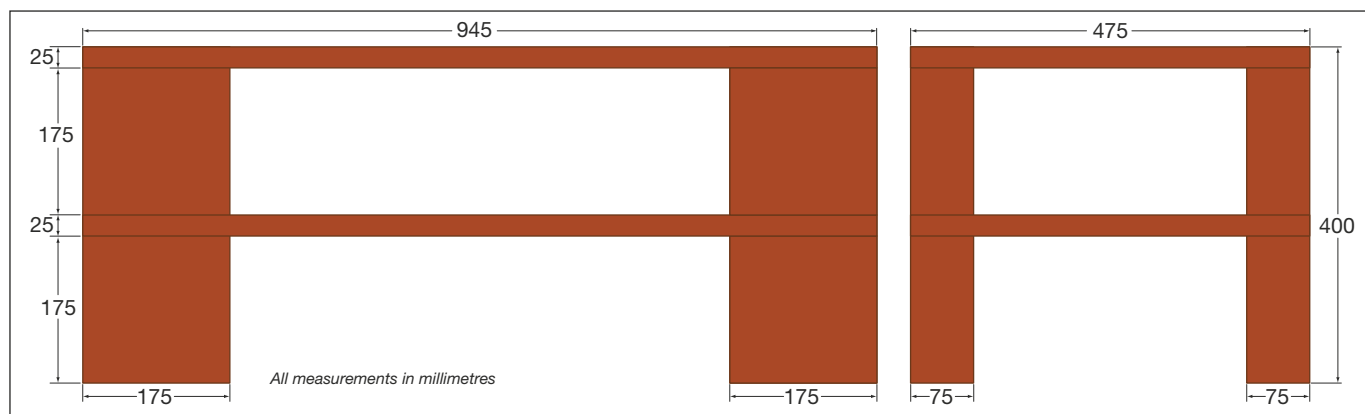
5

I trimmed the panels to size and fine-tuned them with a small block plane



6

I did most of the cleaning up work on the legs with a No 3 smoothing plane



in size, and of course perfectly square, if the assembly is to come together accurately. I cleaned up the ends with a small block plane, **photo 5**, then smoothed off the surfaces with a random orbit sander.

## Simple blockwork

The legs and spacers are all 175mm square and 75mm thick. For a level table the height of each spacer block needs to be identical. I squared up two 750mm lengths, one each for the spacers and legs. However, since my thicknesser can only cope with a maximum thickness of 150mm, I had to do some bench work to ensure a consistent 175mm thickness.

I used one of the beams for the spacers and the other for the legs. That way it was easier to ensure that the components within each group of four were the same height. I cut each component to length on the bandsaw, leaving a sawn edge to be cleaned up with a plane. I did most of the work with a No 3 smoothing plane, **photo 6**, and finished off with a small block plane.

It's important to check regularly that the end-grain edges are square to all long-grain faces. I cleaned up the inside end-grain faces of all the spacers and legs with my random orbit sander at this stage, because they are difficult to get at after the assembly.

## Perfect dowels

The Joint-Genie dowelling jig shown in **photo 7** below allows you to drill precise vertical dowel holes, accurately positioned relative to the edges by use of fences and shims. I positioned two dowel holes on the outside long edge of each leg and spacer, and one at the inside corner adjacent to the long grain edges of the panels.

It's very easy and quick to drill precisely matching holes in the panels and the mating leg or spacer using this jig – see **photo 7** again. I made sure that there was no interference between the dowel holes on either face of the shelf, by simply using different holes in the Joint-Genie array for each side.

Because the top of the shelf and the underside of the top would not be too easy to get at for finishing, I then applied one coat of finish to each face, making sure that the gluing areas for the butt joints were masked off first, **photo 8**.

## The final glue-up

Although the dowelling jig ensures perfect alignment, the resulting glue-up is a pretty hefty task, simply because of the size and weight of the finished article – the 1.4 cubic feet of utile I'd used weighed around 25kg! So I did the glue up in two stages – building

the upper sandwich of shelf, spacers and top first, **photo 9**, then gluing on the legs.

Once the glue on the full assembly was dry, I cleaned up the faces and end grain round the leg and spacer assembly with my big random orbit sander, again working through the grits, before finishing off with hand sanding to 240 grit. Finally, before finishing, I planed a small chamfer round the top and the vertical edges at the corners to take off the sharp edges.

## Finishing touches

The final finish was several coats of my wipe-on oil/varnish mixture. I gave the top surface five coats, to protect it against spills and hot cups. I rounded it off with a couple of coats of well-buffed wax polish.

I think the end product does indeed achieve the design goal of appearing to come from a solid block and, apart from the timber preparation and finishing, the whole construction took only about two days. But I'm afraid it takes two people to move it easily – just like a bulldog, then!

## FURTHER INFORMATION

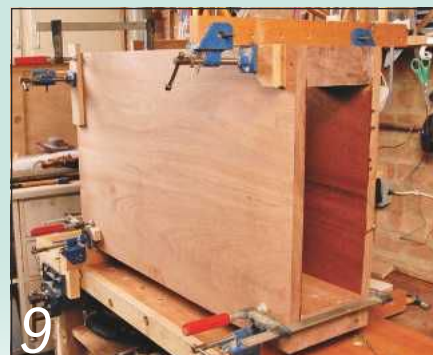
- Joint-Genie Ltd
- 01460 57202
- [www.joint-genie.com](http://www.joint-genie.com)



**7** The Joint-Genie jig is an invaluable aid for positioning the dowels accurately



**8** I applied one coat of my oil varnish finish to each panel face before starting the assembly

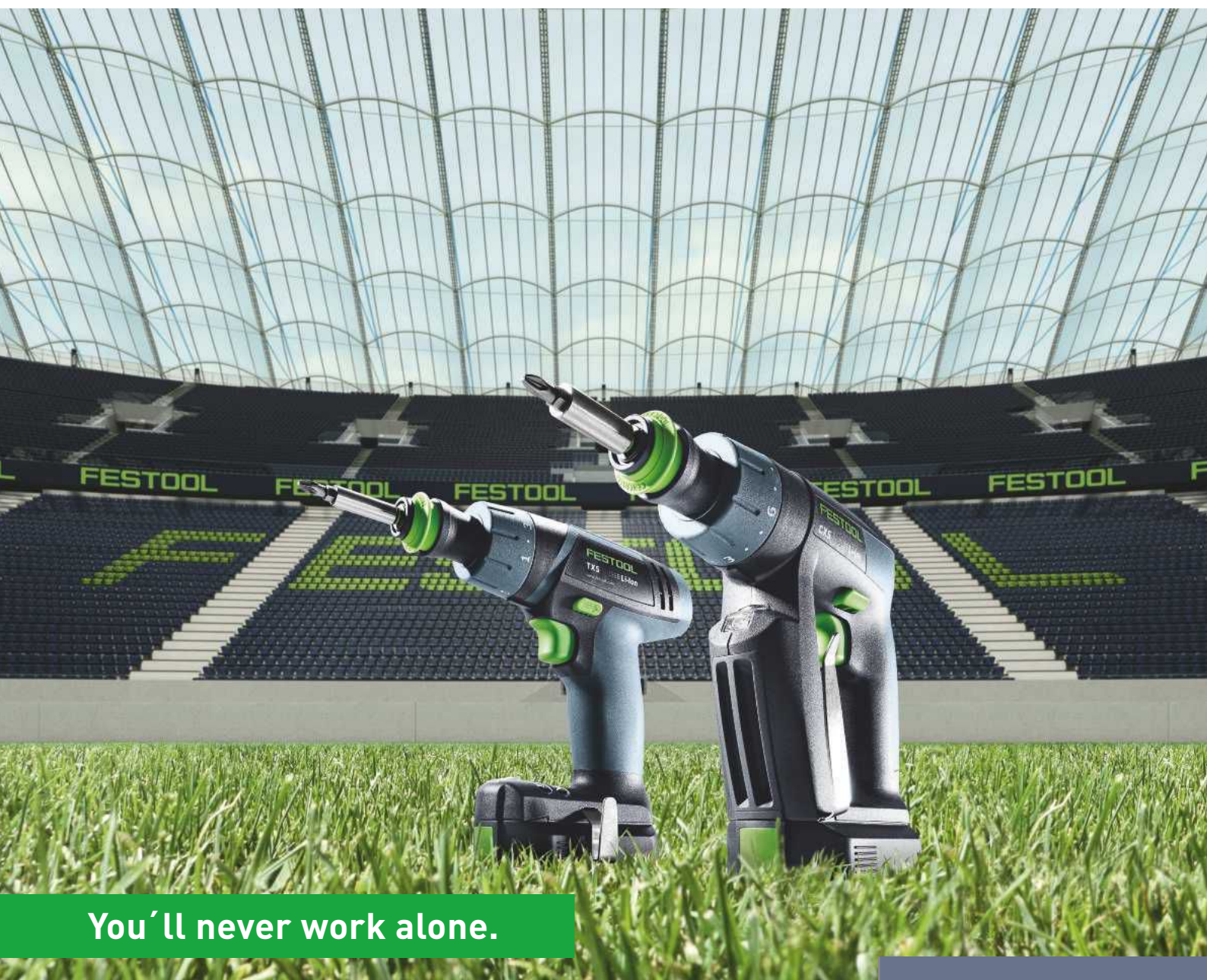


**9** I did the final glue-up in two stages, adding the legs to the panel sandwich in turn



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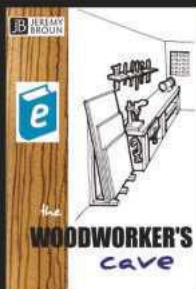
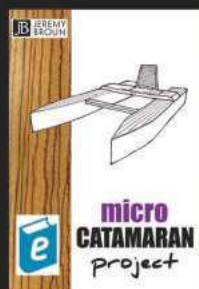
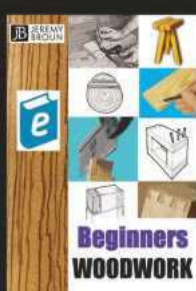
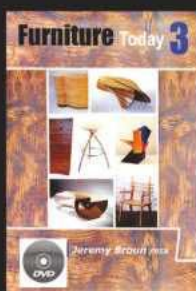
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BY ROBIN GATES



# Take a bow

**The bow saw is one of the woodworker's oldest tools, and also one of the most versatile. Here Robin Gates shares his passion for this traditional wooden frame saw**

**W**ith its light wooden frame, twisted cord and tensioned steel you could almost believe the bow saw to be an early design of flying machine from the Wright Brothers. In fact its ancestry goes back to the Roman era and beyond, when the wooden frame served to prevent a narrow forged saw blade from buckling as its teeth met resistance from the timber. When advances in casting steel enabled production of a much wider saw blade, the supporting frame was no longer required for rigidity, and frame saws were displaced by the familiar handsaws and backsaws of recent times.

## Ancient and modern

Nothing challenged the versatile bow saw, however, until the bandsaw came along. Even now, for many small jobs, the bow saw earns a place in the workshop. Its speciality is cutting curves, and to achieve this it has a blade which is not only narrow for negotiating a tight radius, but which is mounted in brass spigots so it can be rotated by a full 360°.

Add to that the possibility of mounting the

blade to cut on the push or pull stroke and you have the most accommodating saw imaginable. Partly out of habit from using other hand and tenon saws, and partly because I like to have a good view of where the blade enters the kerf, I usually fit the blade to cut on the push stroke.

## Not really coping

In principle the bow saw works much like the coping saw, in that its frame allows a deep cut and can also be angled in a different plane to the blade when following a curve. Unlike the smaller coping saw, the blade of the bow saw is held in the spigots by loose pins. When your fingers are cold it can be a fiddly business adjusting the blade without dropping the pins, but if the pins are lost they are easy enough to replace – a couple of small wire nails will do the job.

Another difference from the coping saw is that the bow saw's frame allows better adjustment of blade tension. The H-shaped wooden frame has two uprights or cheeks joined by a stretcher fitted using loose mortise and tenon joints. The blade is fixed between the lower ends of the cheeks, while

their tops are linked by a loop of cord which is twisted by a wooden toggle, making a windlass and drawing in the tops of the cheeks whose leverage then tensions the blade. The toggle is fitted asymmetrically between the strands of the cord so its long end bears on the stretcher and prevents the cord untwisting. To avoid stretching the cord unnecessarily, I'm in the habit of slackening it by one turn of the toggle before hanging up the saw.

In place of the windlass, some variants were fitted with two threaded rods joined by a bottle screw that was turned using a small



When cutting out a circle, use a two-handed grip with your thumbs on the near cheek



Although the teeth have a rip profile they must cut both with and across the grain when sawing curves



The bow saw can be dismantled in a few seconds for transport or storage



It's a surprisingly child-friendly saw. My son Tom, 10, used it to cut the heel slot for a boot jack



The boot jack does a tricky job with precision, and using it requires minimal effort



Mark a half-thickness line round the edge of a small board with a gauge, ready for resawing



The frame is angled to one side to clear the work, but is unbalanced and needs some extra support from the left hand

tommy bar. Although this arrangement is less primitive, its mechanical advantage may result in over-tensioning and perhaps damaging the frame of a lightly built saw.

## Getting a grip

Typical of a traditional hand tool, the bow saw only shows its true colours when it's in the hand and engaged with the timber. The first question arising might be: how do you hold this saw?

Looking at the style of it and perhaps influenced by the way you use a hacksaw, it might appear that you place a hand on each handle, one each end of the blade. However, the furthest handle – the smaller of the two – is there only for rotating the blade to the desired angle. For most purposes I find an overlapping two-handed grip on the nearer – larger – handle is effective, with thumbs either side of the near cheek to prevent the frame capsizing if you're sawing with the frame not vertical.

The saw's round handle and high centre of gravity can make it prone to twist in the hand if it's not well supported but, that said, the very length of the saw's cheeks provides a useful indicator of the angle of cut when blade and frame are in the same plane. Sometimes, sawing a tricky curve slowly, I place one hand on the handle and the other on the frame. At other times, when cross-cutting a greenwood log or when speed is more important than precision, one hand on the frame alone is good enough. It's all down to experimentation: if it feels right, it is right.

## Coming apart

Take a close look at the blade. Although the teeth have the steep pitch and chisel edge of a saw designed for ripping, it also works efficiently across the grain. This should come as no surprise given its intended purpose of sawing curves, the ultimate example of this being an enclosed aperture.

To cut one you simply drill a pilot hole on the waste side of the line and assemble the saw with the blade running through the hole, then disassemble the saw when the aperture has been cut.

For anyone who enjoys taking things apart, it's one of the secret pleasures of this saw that it can be dismantled completely in a few seconds, making it easier to stow in the toolbox than it might appear. Untwist the windlass, unpin the blade, remove the cheeks from the stretcher, pull the handles free of the cheeks and you can pack this saw neatly inside a large cardboard tube.

## Trying it out

If you abide by the adage of using the right tool for the job, you'll probably reserve the bow saw for what it was designed for – cutting curves. But if you succumb to curiosity, you'll find yourself using it to tackle a wide variety of cuts in both seasoned and green wood, and to the exclusion of other saws. Even disregarding the sheer delight of its handling, the way it steers so precisely, responding to the slightest change in pressure, and the superbly unobstructed view of the workpiece it allows, who can resist its elegant form?

More confident hands than mine use it to cut the waste from dovetail sockets (I'll use a finer toothed coping saw for that), while chair makers use it for the somewhat coarser work of sawing the seat of a Windsor chair to shape before planing its edges smooth. Both uses exploit the bow saw's lightness and manoeuvrability.

The only caveat I'd add with regard to using a bow saw for straight cuts of any length is that it responds almost too well to the worker's hand. If your mind wanders for even a second its narrow blade will dart off course like a bicycle with loose handlebars, whereas the wide blade of a handsaw in a well-established kerf is more forgiving of a temporary lapse in concentration.

That said, I'd suggest that the adventurous woodworker will go on finding new uses for this saw for as long as it hangs in the workshop.

## Child friendly

When our son Tom was having a difficult time at school in Year 7, we decided to give him a break from the system with a year of home schooling. We included a good spell of woodwork in the Design & Technology component of the National Curriculum, placing emphasis on making things that would be useful around the home.

Following a muddy walk in January and the usual frustrations of getting your boots



off when you're ten years old, cold, tired and hungry, we decided on a boot-removing device as his spring term project.

Having tactfully considered the feasibility of Tom's preference for a voice-activated robot, we settled on the sort of boot jack you find on sale in any garden centre. This required him to saw a largish notch in one end of a  $\frac{3}{4}$ in thick board to grip the heel of the boot being removed. Suspecting that he might find this hard going with the coping saw, I showed him the larger bow saw. He took to it in an instant, ripping down the tapering sides of the notch and cutting its curved base without a hitch.

Our daughter Annie, 13 at that time, said she was having trouble with the coping saw in her own school DT lessons. I wondered if this was because the coping saw is so light and she was pushing down too hard to make it cut, twisting the blade in the process. I wonder if the more substantial bow saw with its solid wood frame, requiring only the easiest of pushes to keep it cutting, would be a better tool for school workshops.

### Book-matching

A bow saw isn't designed for resawing, that is reducing the thickness of a board by ripping along the lengths of its edges. However, it does have features which recommend it for this job with small boards; the rip tooth blade, the narrowness of the blade reducing friction and allowing good sight of the line, and the ability to angle the frame to pass clear of the board. I used the bow saw to resaw a salvaged elm board when making the candle box (shown right), then used it again to cut its curved edges.

To resaw the board, I first scribed around it to the required thickness using a marking gauge, not forgetting that perhaps  $\frac{1}{16}$ in of thickness would be lost in saw dust. Next I popped the board into the large hand screw and sawed it alternately from each corner, rotating the board 90° after each cut, until the four kerfs met in the middle. Now I had two boards for the price of one, with the grain pattern of one mirrored by the other.

The bow saw has less to recommend it for resawing a long board. Sawing for any length with the frame tilted to one side – so as to pass clear of the board – the saw is unbalanced and requires one hand high on the frame for support. As the narrow blade is prone to wander it can leave a lot of cleaning up to do with the plane. A frame saw designed for resawing has a wider blade spanning the centre of a rectangular frame, so that the stretchers on either side pass clear of the timber and the tool remains balanced.



8 Having sawn from all four corners in turn, the kerfs are about to meet in the middle



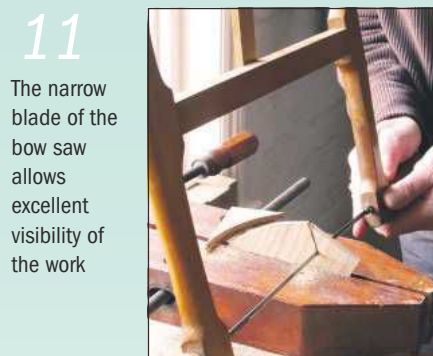
10 I sawed the arched back of this candle box while holding it in a hand screw cramped to the bench



12 The candle box completed; all the other curves were also cut with the bow saw



9 The resawn boards are book-matched, and are shown here after initial clean up



11 The narrow blade of the bow saw allows excellent visibility of the work



13 The saw is good for green woodworking too. I use a one-handed grip and a tall bench dog for support

### Finding your saw

My bow saw dates from the 1960s and is of unknown make, but it appears identical to Marples saws of that time. The wooden frame is solid beech, which is typical, although I've seen some lovely examples in ash, a timber known for its spring and shock-absorbing character, so well suited to a tool which must be tensioned. On better quality vintage saws, the handles may be of fine-grained boxwood.

Old British tools were made to imperial measurements, so the blade on mine is 12in long and  $\frac{3}{16}$ in wide, with 9 teeth per inch (tpi). The distance between blade and stretcher allows a maximum depth of cut of 6in, but remember you can rotate the blade so in theory the depth of cut is infinite.

Some people have made their own bow saws using a length of bandsaw blade, but you would probably need a bow saw (if not a bandsaw) to cut out the cheeks. Bow saws in various states of repair appear

regularly on eBay, but with an old saw bought 'as seen' you run the risk of it being damaged or blades being hard to find. It's best to avoid disappointment by buying new.

Crown Hand Tools in Sheffield make a bow saw like mine, in beech with a 12in blade, which is available from Mortens Hardware Store in Yorkshire at £59.99. Tools For Working Wood in the USA offer the Gramercy saw in hickory with three interchangeable blades having 10, 16 and 24tpi, at \$150. For \$49.95 they will also sell you a kit of brass spigots, handles and blades if you fancy making the wooden frame yourself.

### FURTHER INFORMATION

- Mortens Hardware Store
- 01943 609131
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BY BOB DAREY

# Look what you can do with an Overhead router

**I've been a dedicated woodworker all my life, and in my 83rd year I'm still avidly reading *The Woodworker* and planning various projects. Here's something I've worked on for a long time...**

**T**he impetus for my latest overhead router project was driven by necessity. My workshop has limited space – and my bank balance has limited funds! – so purchasing a standard overhead router was not an option. My own overhead router is the culmination of around ten years of development work, during which time I've made refinements to the initial prototype and improved various elements, problem solving as I've gone along.

## In the beginning

It all started with my floor-standing drill to which I added a compound table (a fixed bed of waterproof ply) and fixed table fences. Searching through my workshop, I rediscovered a stirrup for converting drill



**1** The collet extension was purchased from Record Power. The collets – a 1/4in TA54 and an 8mm TA32 – and the spiral downcut cutters came from Wealden Tools





**2** The cross vice table is mounted on the drill stand and holds the compound table – a fixed bed of waterproof plywood



**3** The router is mounted on the stirrup on a Tufnol base. The fine-height adjuster consists of two locknuts, a winding handle and a fixing bracket. I engineered the steel bush to project 2mm below the base of the router



**4** The router is controlled by an NVR switch located conveniently below the table



**5** The Tufnol table is attached to the plywood sub-base, which I drilled and tapped in a 40mm square grid. This photograph also shows the dust extraction arrangement



**6** The extension table increases the work capacity dramatically. I made this from 10mm clear acrylic sheet, which I also drilled and tapped in a 40mm square grid



**7** To prevent the extension table from sticking and to ensure a smooth movement, I made the side runner with a spring adjustment. The extension table is locked in place with two 6mm screws, driven into the drilled and tapped holes



**8** The extension table allows me to secure and rout relatively large work pieces – such as those involved in making the ornate cabinet shown on page 49 – with ease and accuracy



**9** The finished overhead router is the culmination of many years development, and is a joy to use!

mortises to cutting mortises. I realised that the collet extension would be critical to the success of the overhead router. Taking a regular 12mm shank, I used my small Axminster lathe to reduce it to 8mm. Being hardened steel, this was achieved by taking a succession of small cuts and utilising the lathe's auto-feed.

### Mix and match

At this stage I thought I'd cracked it. However, an annoying vibration appeared. This, it turned out, was the result of the reducing collets being plundered from various machines which were in retrospect old and possibly worn. A swift phone call

later and with new reducing collets purchased from Wealden, the vibration disappeared.

I sincerely hope this brief account and the accompanying photos are of interest to readers, and that it spurs people on to have a go themselves.



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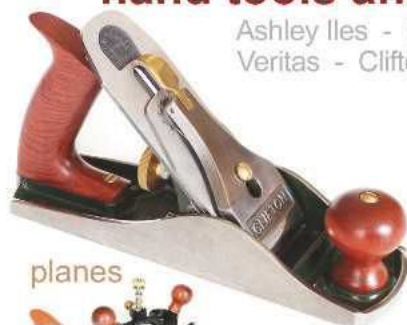
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BY MARK CASS

# Tapered elegance

**With a new home to fit out, it came as no surprise to me to hear the words “Dad, will you make us a table?” Obviously the answer was yes. One advantage of this type of gratis job is that the deadlines can be a little bit more flexible than usual, the work generally being fitted in around other projects**

**C**ontemporary looks were called for here, and I felt that this could be a good time to try out one of my pet safety ideas – a table with no protruding corners for toddlers to bang their heads on. My design approved, it was time to head down to the timber recyclers to pick out some wood. Beech had been mentioned as a possibility – low-key appearance, goes with everything – and so I was pleased to see a few lengths among the rack of mainly joinery-shop offcuts and rejects.

## Check the quality

Although you can get a bargain at this type of establishment (check your Yellow Pages), the quality can be variable to put it mildly, so make sure you buy more than you think you'll need. If you are making just for the pleasure of it, you can afford the extra time on careful machining to avoid the defects, unlike the busy wood machinist who finds it cheaper just to throw the dodgy bits away.

## Don't spare the rod

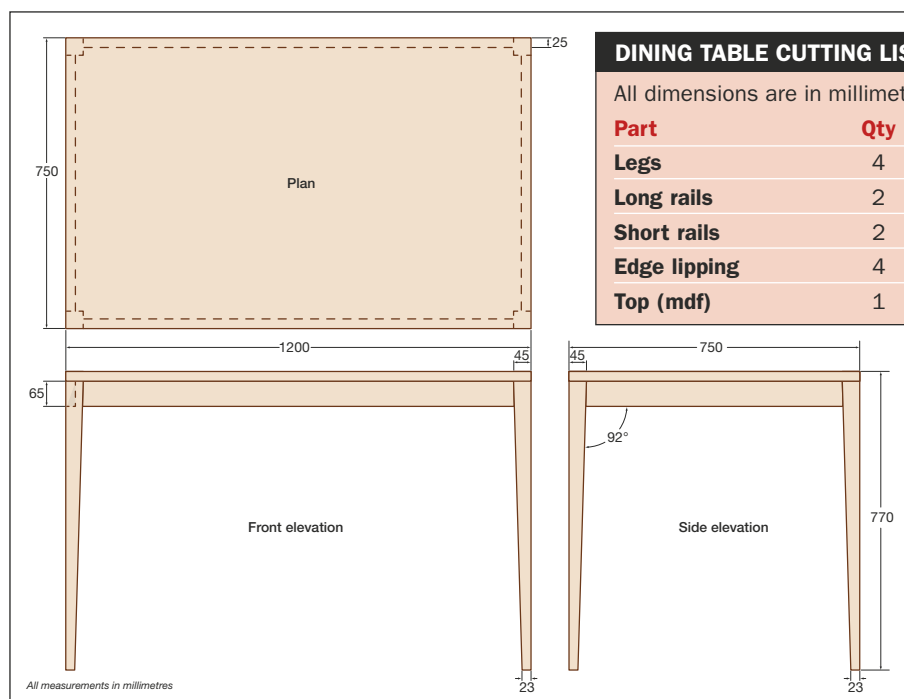
The first step of any job like this should always be making a rod. A rod is nothing more than an accurate, full-size drawing of the piece. It's both a way of confirming dimensions and proportions of the design and a permanent reference for checking components as they are fashioned throughout the job.

I'll usually make use of any old offcut of thin mdf, but if you really want to push the boat out, white faced hardboard will make a very nice job of it.

## Planning the taper

Tapered legs always make a piece look that little bit lighter, especially if they are splayed out a touch too. That was the plan for this table, and I've found that an angle of as little as 2° past square (90°) is sufficient to lend a touch of elegance to a piece of furniture.

While pleasing to the eye, this type of design does introduce a complication or



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two to the construction. No longer are the tenon shoulders square, but slanted, and not even at the angle of splay, as the taper increases this angle still further. All this becomes clear while drawing out the rod.

## Calling up the Domino

It's good to have the luxury of time on a job, and to craft every joint by hand in the ongoing search for something approaching perfection. With other work stacking up around me and family pressure slowly increasing, it soon





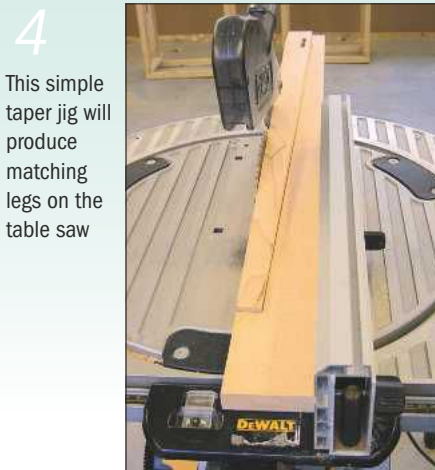
1  
With the cutting list drawn up, it was time for some machining of the various components



2  
Marking out for dominos is similar to that for biscuits. Note the mark on the leg top denoting inside faces



3  
The Festool Domino makes a super-clean mortise each time, albeit with rounded ends



4  
This simple taper jig will produce matching legs on the table saw



5  
Clean up the tapers with a sharp plane; note the tapered off-cut helping in the vice



6  
With each component securely clamped, machine the rail ends for the dominos





7 You can now make the final angled cut on the rail, removing only the absolute minimum



9 This excellent WolfCraft band clamp made all the difference during the glue-up



11 ...and the new cut edges chamfered gently with a small block plane to match the rest

became clear that this particular job didn't quite belong in this category.

Although I'm proud of my handiwork, I'm a big fan of technology, and so it was with considerable pleasure that I reached for my Festool Domino joiner. This is a terrific tool, able to cut mortises for ready-made loose tenons (the dominos) in just about any situation a woodworker could imagine.

## Work begins

With my cutting list drawn up, it was time for a spot of machining, **photo 1**, and an opportunity to familiarise myself with the timber. This is when you get to spot the good pieces, the also-rans, the spares and the 'only if desperate' pieces, as the cutting list gets slowly ticked off.

Over the years I've made most of the mistakes in the woodworker's manual of 'things not to do'. So instead of steaming in and shaping the legs straight away, as I would once have done, this time I left them



8 With all the parts machined, apply the chamfer to the edges with a palm router



10 Once the frame is ready, the leg-tops can be trimmed flush with the side rails...



12 Plane the edges of the MDF top perfectly square, ready to take the lipping

over-length and resisted the temptation to taper them until I had carefully inspecting and marked them as follows, **photo 2**:

- **Outside faces** – the best two out of four for each leg;
- **Orientation** – I like to group them together and draw a square on the tops to show at a glance which way round they go;
- **Rail positions;**
- **Dominos**

## Mortise time

After a final check, it's time for some mortising. Here I'm going to use the Domino. While the legs are still a uniform section, cutting the mortises for the loose tenons is straightforward. As long as each component is securely clamped down, the job is done in a surprisingly short time. Eagle-eyed readers will observe that the width setting on the Domino is on 'medium' for this part of the joint, **photo 3**, and has been selected so as to allow for the angled ends of the rails.

## Tapering off

I always cut my tapers on the table saw, but there is no reason why a similar technique can't be used on the bandsaw. First make the simplest of jigs – nothing more than an offcut with the leg profile cut out of it. To mark it out, simply measure out the desired thickness of the leg top, the overall length required, the thickness of the leg bottom, join the dots and there you are, **photo 4**.

Note that this jig will produce tapers on two adjacent faces of a leg. If you want to taper all four (something I have never felt the need to), then a different technique will be required. Do a spot of careful adjustment on the saw, set up the guards and the dust extraction, and away you go. As long as all your components are of the same overall dimension, you'll have no trouble producing duplicate elegant tapers.

## Plane sailing

Accurate machining with a sharp blade should produce good clean results, but there will always be saw marks to remove, so now is the time to get that lovely freshly-sharpened plane off the shelf and to put it to good use. Check that it's set up properly on a piece of scrap, as you don't want to undo your good work by planing one of the legs out of square. In fact, just the bare minimum needs to be taken off here, **photo 5**, and only on the newly tapered inside faces at that.

## Taking the rails

With the legs cleaned up and put to one side, it's time to address the rails. Although the ends will be slightly angled, I found it was best to leave the rails ever so slightly over-length, with the ends cut square. This makes the domino mortising easy, **photo 6**, with standard-width mortises (Domino setting: small) being employed for this stage, giving a pleasingly snug fit.

By referring to the hallowed rod, the correct angle can be measured – or simply 'copied' with a sliding bevel – and transferred to a chop saw.

A final check of the lengths required and the rail ends can now be cut to the final angle, **photo 7**. By trimming off just the bare minimum, the domino joint will go together cleanly.

## Adding the chamfers

One of the key features of this design is the 2mm chamfer on every edge, and, while this is not a particularly taxing task with a hand plane, there's something about the perfect regularity of a machined edge which led me to employ my nifty little Bosch palm



router and a chamfer cutter, **photo 8**. It ensures rapid progress and a fairly low risk of a routing disaster.

### Framing up

With the legs and rails machined, jointed and cleaned up, it's time for the assembly. I've learnt the hard way just how important it is to have a dry run at this. Take the time to put all the joints together and prepare all the cramps that will be required.

When you're satisfied that everything is going to fit, go ahead and start the glue-up. Although there is a strong case for using polyurethane glue in this situation – for what is effectively a mortise-and-tenon joint – I much prefer the more sedate pace of work afforded by pva glues.

### Cramping square

The combination of a WolfCraft band clamp and a variety of F and sash cramps enabled me to get the table frame together with little difficulty – something that's not always possible with an angled or tapering workpiece, **photo 9**.

Before stepping back with satisfaction, it's essential to check for square and winding, and to make any necessary adjustments while the glue is still soft.

The next day it was time to trim the tops of the legs, **photo 10**, chamfer the newly created edges by hand, **photo 11**, and give the whole frame a general clean-up – something's that much easier to do before the top has been fixed on.

### Preparing the top

With the table top needing to be stable – any shrinkage would be immediately apparent with this design – I decided to lip some 25mm thick mdf and to get it veneered at my local veneer presser. It's a fairly straightforward job, involving some accurate measurement and truing up the board edges, **photo 12**.

I always take the precaution of sealing the edges of raw mdf with diluted pva adhesive to ensure a better 'take' when gluing on the edging material, **photo 13**.

I mitred the lipping carefully, **photo 14**, then glued and taped it to the squared-up and still sharp edges of the board, **photo 15**. Once that was cleaned up, it was down to Steve's place and his hot veneer press.

### Bringing it all together

When the top was ready, I was at last able to offer it up to the base in a variety of ways to see how it would look best. With the orientation decided, some careful hand-planing matched the edges with the slope



13 Seal the raw mdf edges with dilute pva adhesive to help counteract their natural absorbency



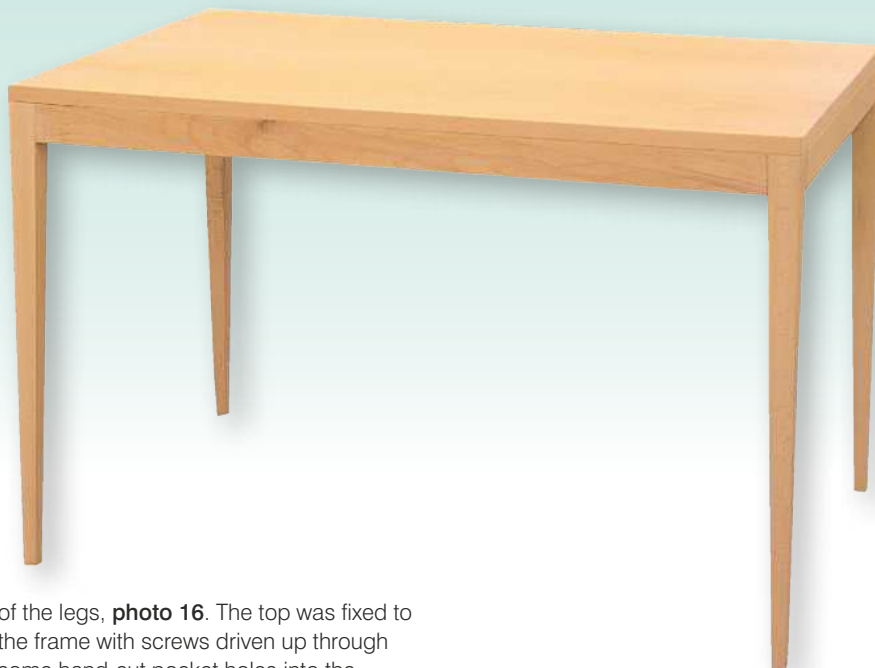
14 Mitre the lengths of edge trim carefully to fit round the perimeter of the top



15 ...and glue and tape the four lengths into place along the board edges



16 Match the edges of the table top with the chamfer on the outer corners of the legs



of the legs, **photo 16**. The top was fixed to the frame with screws driven up through some hand-cut pocket holes into the underside of the top.

### The big finish

It was now time to apply the finish. The table was sanded to 240 grit on the frame and 320 grit on the top. When not left in its natural state, beech is rarely given much more than a factory-applied spray lacquer coat. With its uniform and fairly bland appearance, plus an irregular micro-grain structure designed to defy the French polisher's skills, I knew I had my work cut out to get it looking half-way decent.

I started with a coat of grain sealer (Behlen's Pre-Stain), to give myself a better chance, then painstakingly applied sundry coats of colour and varnish until I was almost satisfied. With careful rubbing-down between coats, the end result was finally reached... I only had to re-do it twice!

All's well that ends well, however, and the table was delivered in good shape and immediately pressed into active service. Another satisfied customer...

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BY ALAN HOLTHAM



# Challenge bowl

**Last month I took a look at the spalting process and the way it turns ordinary wood into a material with dramatic colour and figuring that turners love. This month I'll show you some of the techniques you need to master in order to work it successfully**

**T**he term 'spalted' is used to describe wood in the first stages of rot, a state that causes it to develop a totally fascinating variety of colours and patterns not normally characteristic of that timber. These patterns can be quite magnificent, with zones of different colours separated by fine black lines in a highly ornate pattern. The extent of the patterning varies enormously, depending on the number of different fungal attacks that have infected the wood. One of the best ways to exploit this natural phenomenon is to cut the wood into blanks and then turn it on the lathe. I've chosen a beech blank, **photo 1**, to illustrate some of the problems of turning spalted timber.

## Potential problems

For a start, it can sometimes be a bit tricky to season spalted wood. If it's evenly infected and discoloured, then all the stresses seem to have been equalised. But if the spalting is more varied, or has occurred in definite planes, then splits will often develop along the boundaries, with the stresses obviously now overcoming the weakened timber.

There are no specific techniques involved when working spalted timber, other than keeping your tools sharp and being patient. The continual tearing of soft areas causes frustration, particularly when a fine finishing cut leaves a smooth surface but with a couple of deep tears. Trying to fill these just highlights the problem, so there's often no alternative to lots of sanding. The only snag to this is that the different densities sand out unevenly, the soft areas often getting quite



**1**  
This spalted beech blank had some promising surface figuring



**2**  
Even with the sharpest tools, little patches can be plucked out to quite a depth



**3**  
Problems also occur when a soft area adjoins a sound, harder one



**4**  
If the blank appears soft, use a faceplate and attach it with plenty of big screws



**5**  
The best tool to use for shaping small bowls is a bowl gouge sharpened to 45°



**6**  
The wood is fragile, so proceed by taking initial cuts as gently as possible



**7**  
You'll get clean cuts on hard patches and jagged tears on softer ones



**8**  
Try turning the gouge upside down to produce a fine shearing cut

hollow compared to the harder surrounding timber. To even this out I find it's best to use a powered sanding pad, which spreads the wear more evenly.

## Health issues

The dust from spalted wood is often cited as a particular health hazard. I have seen no scientific evidence that the dust is any

more injurious than dust from normal wood. I do know, however, that they are both potentially hazardous, so I always wear some personal protection in the form of an air-fed helmet as well as running my air cleaner when I'm turning spalted wood.

Although it has developed through the initial phases of rotting, spalted wood is quite stable once it has been dried. With

no moisture in the wood the rot can't survive, and the timber won't deteriorate any further unless it gets wet again.

## Uneven textures

The downside of spalting is that as the wood starts to decay, it becomes softer. Generally speaking the heavier the spalting, the softer and more difficult the wood is to cut cleanly. The main problem is that little patches are plucked out to quite a depth, **photo 2**, no matter how sharp your tools are. However, there are a few tips that can minimise some of these difficulties.

A more awkward situation occurs where there is a distinctly soft area next to a much sounder section, **photo 3**. Although the effect of this may be visually quite dramatic, it is much more difficult to work, as the turning tools tend to bounce when they encounter the different densities of wood as the blank spins, and you end up with a very uneven surface. The problem becomes even more acute when you start sanding the wood.

## The chosen one

Nevertheless, I've selected just such a bowl blank to try to illustrate the turning process. Sadly, although it appeared to be well spalted, closer inspection revealed that the patterning was all on one surface and the underside was relatively plain. I was then faced with the dilemma of which way to mount it. Making the well-marked side the top will result in most of it being turned away. In the end I settled on putting the better spalting to the underside in the hope that I could turn down into it in the base of the finished bowl.

## Beginning to turn

The first problem is physically mounting the blank on the lathe, particularly if the wood is very soft. If there's a reasonably sound section, you can use a large woodscrew chuck and rely on just the one fixing. If it's softer, use a faceplate with plenty of big screws to get an adequate hold, **photo 4**.

You can then start the turning process. Remember that the internal density can vary tremendously, so keep the lathe speed down to minimize any vibration. I've found that the best tool to use for these small bowls is a 1/4in bowl gouge with the bevel sharpened to about 45°, **photo 5**. Bear in mind the fragile nature of the wood and make the cuts as gentle as possible, **photo 6**. This is the key to working spalted



wood. You simply can't lay into it with heavy cuts as you can with sound timber. Slow and easy are the watchwords here. Above all, keep the pressure of the tool down on the toolrest, rather than on the wood, to minimise bouncing.

### Mixed results

No matter how sharp your gouge is, the finish will be extremely variable, with clean cuts on the harder patches and jagged tears on the soft ones, **photo 7**. This blank revealed a couple of quite major splits along the zone boundaries too. I reduced its diameter to get rid of some of the splits, but left the rest to be dealt with later on.

As you get near to the finished profile, start taking finer and finer cuts to reduce the tearing damage. Re-sharpen the tool regularly as well; it's amazing just how abrasive this very soft timber seems to be, and anything less than a razor-sharp edge will tear rather than cut.

Another old trick that's worth trying is to turn the gouge almost upside down to produce a very fine shearing cut that slices cleanly through all but the softest patches, **photo 8**. However, you have to accept that you're not going to get a perfect surface straight off the gouge with this wood. Just do the best you can with the last few finishing cuts.

### Getting a grip

I prefer to use a recess for re-chucking, as I find it more secure than gripping onto a spigot which can be rather unpredictable in density. Use a narrow parting tool to mark out the recess, and try to make the diameter as close as possible to the true diameter of the chuck jaws to maximize the amount of grip, **photo 9**. If the material is well spalted, allow some extra depth to the recess to compensate for the weaker material.

Even a sharp parting tool will rag the edges of the recess, **photo 10**, but you can clean these up with a slicing cut made holding the skew on its back, **photo 11**. The waste within the recess can then be cut away with a steeply bevelled spindle gouge using a pull cut, **photo 12**. Aim to end up with the recess as clean as possible off the tool, and with a sharp corner to maximise the chuck's grip, **photo 13**.

### Glue and sand

Once you've finished shaping the outer profile of your blank, your next job is to check it all over carefully for cracks and severe tears. The best way to stabilise these is to flood them with very thin superglue,



**9** Cut the chucking recess to match the diameter of your chuck jaws



**10** Even a sharp parting tool will leave somewhat ragged edges to the recess...



**11** ...but you can clean these up with a light slicing cut made with a skew chisel



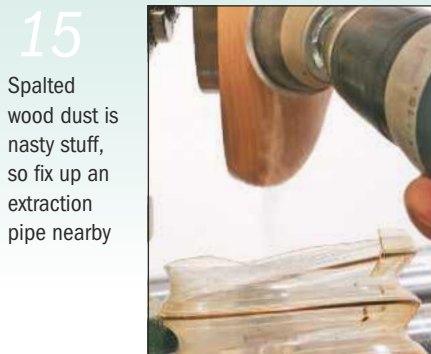
**12** Cut away the waste in the recess with a steeply bevelled spindle gouge



**13** Aim to end up with a square-edged recess that will maximise the chuck's grip



**14** Stabilise cracks and tears by flooding them with very thin superglue



**15** Spalted wood dust is nasty stuff, so fix up an extraction pipe nearby



**16** To minimise black dust stains, rub in some thinned-down sanding sealer

**photo 14**, letting it soak well into the defects. This dries hard in a few seconds, hardening up those very soft patches and sealing any cracks.

You can then start to sand the surface carefully, but avoid overdoing it or you'll wear away the softer areas more than the harder ones and the surface will become very irregular. Power sanding is best as it

seems to spread the wear more evenly.

Some form of dust extraction as close as possible to the surface you're sanding is essential here, as the spalted dust is particularly offensive. I've found that the best way to get the extraction pipe near to the action is to bolt a large spring clip on the end, which can then be clamped onto the bed bars just where you need it. It's very



**17** Repeat the sanding and sealing process several times to get a clean surface



**18** In sanding the bowl, I inadvertently rounded over the edges of the chuck recess!



**19** After sealing the outside of the bowl, apply some pastewax with a small pad of steel wool



**20** Make sure you reverse the work back onto the chuck perfectly square



**21** Start turning out the inside of the bowl with light, gentle cuts...



**22** ...and don't be tempted to cut the walls of the bowl too thin; they may crack



**23** I charred the bowl's rim lightly for contrast by holding a block of hardwood against it



**24** Wax the interior once more and buff it up to a soft natural sheen with a soft cloth

satisfying to see the dust being sucked straight down into the pipe, **photo 15**.

## Keeping it clean

The other problem with sanding spalted wood is that a lot of the black dust from the zone boundaries gets deposited in the torn grain of the soft light-coloured areas, giving it a very dirty appearance. To overcome this,

do a little sanding, stop the lathe and rub in a coat of thinned-down cellulose sanding sealer, **photo 16**. This dries in no time and you can then sand again, but now the black dust is reduced and the grain is filled a bit. Keep repeating this procedure until you get the finish you want. You may have to do it five or six times to get a smooth and clean surface, **photo 17**.

During the power sanding I accidentally rounded over the internal edge of the chucking recess, **photo 18**, which makes a nonsense of what I said earlier about maximising the grip. However, I rather liked the effect it created, so I decided to risk carrying on rather than turning it again. Fingers crossed!

## Outside finish

With spalted timber I nearly always finish the surface with pastewax, so after building up a good basecoat on the outside of the bowl with several coats of sanding sealer, I applied the wax with a small pad of 0000-grade steel wool, **photo 19**. I find that oil finishes tend to go very patchy on spalted wood, even after so much sealing, and the high gloss finishes tend to look inappropriate anyway with such extreme decorative figuring.

## Back to the turning

Take care when you reverse the work back onto the chuck that you get it dead square, **photo 20**, particularly if like me you have reduced the recess depth. Go steady when turning out the inside of the bowl, **photo 21**, just taking gentle cuts until you get a feel for how even the timber is. Don't be tempted to try for over-thin walls, **photo 22**. Spalted timber has no real strength, so it's better to leave the walls a bit fuller, and to keep stopping the lathe to douse soft patches with superglue as you get near to the final thickness you want.

## A minor disappointment

As I'd feared, the finished bowl revealed two coloured areas with a disappointingly small amount of spalling. So, in an effort to try to tie these two contrasting areas together, I charred the rim lightly by holding a piece of hardwood against it as it was spinning, **photo 23**. I'm still not sure if this works or not! Finally, repeat the sanding sealer procedure on the inside; then wax it again, **photo 24**, buffing the wood to a natural sheen with a soft cloth.

After much frustrating, time-consuming and dusty work you should now have a beautifully finished piece of spalted timber. My finished piece was a little disappointing, but every day is a learning day!

The bonus is that you don't need many tools to turn spalted wood, as you can see in the main picture on page 57. I used just a 1/4in bowl gouge for most of this project, with a little help from a 1/4in parting tool, a 3/4in skew and a 1/4in spindle gouge. A few simple tools really do go a long way!





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**27th Feb | 28th Feb | 1st March 2015**  
**Kent Event Centre, Maidstone, Kent**





BY COLIN SIMPSON

# Who's the fairest?

**Hand mirrors are relatively simple to make and incorporate both faceplate and spindle turning. The mirrors can be bought online, or you could ask your local glass supply shop to cut one for you**

**W**hile the turning is simple, it's important to choose your wood carefully. We all know that wood will move due to changes in the relative humidity of its surroundings, and we also know that glass is inflexible and fragile. Therefore dry wood is essential for the mirror frame. If possible choose quarter-sawn wood – that is wood that has been cut so the growth rings are at approximately 90°

to the sawn surface. Quarter-sawn timber is more stable and far less likely to cup.

Any species of timber can be used, but keep in mind the weight of the overall piece. It's best not to choose very heavy species. I used brown oak.

The wood for the handle should have the grain running parallel to its length. Avoid timber where the grain emerges from the side of the blank, **photo 1**. This short grain,



1 Avoid this type of short grain. The grain should run the entire length of the handle



2 Stick the frame blank to a scrap wood disc screwed to a faceplate



3 True up the top surface using a pull cut with a fingernail profile gouge



4 Then true up the edge using the same gouge, but this time with a push cut



5 Mark the diameter of the mirror on the face of the piece with a pencil



6 Use a parting tool to cut a groove just to the right of your pencil mark



7 Use a square-ended scraper to ensure that the bottom of the recess is flat

as it's known, will considerably reduce the strength of the handle.

I used a 145mm diameter mirror and my frame was 190mm across. The handle started as a 25mm square 210mm long, finishing at just under 200mm.

### Preparing the frame

Screw a 100mm diameter disc of scrap wood or mdf to a faceplate and glue the blank to it, **photo 2**. True up the top surface using a pull cut with a fingernail profile gouge, **photo 3**. Then true up the edge of the blank using the same gouge, but this time use a push cut with the shaving coming off the tip of the tool, **photo 4**.

Mark the diameter of the mirror on the face of the piece, **photo 5** and use a parting tool to cut a groove fractionally to the right of this mark, **photo 6**. Now remove the waste wood inside the groove to make the recess for the mirror. You can continue to cut successive grooves next to each other with the parting tool, but it's quicker to use a bowl gouge.

### Checking the recess

When the bulk of waste material has been removed, use a square-ended scraper to ensure that the bottom of the recess is flat, **photo 7**. Now cut a smaller dovetailed recess in the middle to fit the jaws of your chuck, **photo 8**. Check for flatness using a straightedge, **photo 9**; I'm using a small cabinet scraper here.

The mirror needs to be a tight fit in the recess, but this means that any movement of the wood could cause the mirror to crack. To reduce this problem I like to undercut the bottom of the recess a little and I do this using a spindle gouge, ground to a long point. Keep the tool well over on its side and rub the bevel of the tool on the bottom of the recess. The tip of the tool makes the cut, **photo 10**.

Now shape the rim. I opted for a very simple continuous curve which I cut with a





8 Cut a smaller dovetailed recess in the middle to fit the jaws of your chuck



9 Check for flatness with a straightedge; I used a small cabinet scraper

spindle gouge, **photo 11**. Continue the curve to round over the top of the recess. Here I used the spindle gouge on its side with a pull cut, **photo 12**.

### Finishing the back

With the rim finished, remove the piece from the glue chuck and mount it on your four-jaw chuck so you can complete the back. I cut a convex shape, again using a pull cut, and blended it into the rolled rim. For decoration I cut a few beads using a skew chisel, **photo 13**, and then slightly concaved the very middle of the back, **photo 14**, to prevent the mirror from rocking on the dressing table.

Sand the piece down to 400 grit and apply the finish of your choice. I like to use an acrylic lacquer of these pieces because it's hard-wearing. A couple of coats sprayed on and gently knocked back with wire wool between coats will do the trick, **photo 15**.

### Drilling the frame

**Photo 16** shows a simple jig that I use to hold circular pieces vertically for drilling on my drill press. It's simply a piece of mdf glued and screwed at 90° to an mdf base, with two pieces of softwood glued to the upright at 45° to the base. It's essential to clamp the workpiece to the jig and also the jig to the drill's table.

I first made a small flat on the edge of the mirror frame by drilling with a 16mm Forstner bit. Then I drilled a 10mm hole in the centre of this flat to receive the handle spigot.

### Turning the handle

Mount the handle base between centres and turn it to a cylinder with a spindle roughing gouge, **photo 17**. Wherever possible I like to work from the tailstock end towards the headstock when doing spindle work, **photo 18**. You could, of course, use callipers to check the diameter as you work, but on this occasion I used a handy 10mm open-ended spanner.



10 Undercut the edge of the recess a little to allow for movement of the wood



11 Now shape the rim. I opted for a simple curve cut with a spindle gouge



12 Continue the curve to round over the top of the recess using a pull cut



13 Cut a few decorative beads at the centre using a skew chisel as a scraper



14 Then slightly dish the middle to stop the mirror rocking when it's put down on the dressing table



15 Turn the lathe at a very low speed or by hand when spraying on a lacquer finish



16 This simple home-made jig holds the workpiece truly vertical for precise edge drilling



17 Mount the handle base between centres and turn it to a cylinder



18 Starting at the tailstock end of the piece, turn a 10mm diameter tenon



19 Begin shaping the handle with a few decorative beads next to the tenon



20 Then create a smoothly flowing curve along the rest of the handle



21 To finish it, round over the tail of the handle and turn a small ball at the end

You can turn the handle to whatever shape you like, but I opted for simplicity. I first turned a few beads next to the tenon, **photo 19**, and then cut a flowing cove, **photo 20**. Finally I rounded over the end of the handle and turned a small ball end, **photo 21**. Before parting off the ball, I sanded and lacquered the piece. Then all that remains is to turn or saw away the waste wood by the ball and sand away the last little stub by hand.

## Assembly time

I glued the handle spigot into the frame using pva adhesive, and cramped it in place until the glue had dried. There are specialist glues for mirrors on the market, such as Mirror Mate, that are said not to attack the mirror backing. However, I've always used a clear standard silicone mastic and have never had any problems with it. Apply about six small dabs of mastic in the recess and insert the mirror, press it down gently so it's level with the rim all round, and then let the mastic cure.

On reflection, this has turned out to be a very attractive little project!





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I first came across ornamental turning many years ago when I was scanning some old woodworking magazines in a library one afternoon. The author of an article in one of the magazines was the owner of a Holtzapffel lathe. Together with describing this, he added some images of work that he had produced.

### Original inspiration

In addition, and much more important for me, was a short discourse on a book – *Le Manuel du Tourneur* by L E Bergeron – together with copies of some of the plates. The shapes that Bergeron had drawn astounded me, as they implied that it was possible to produce such shapes on the lathe that he illustrated.

It had never occurred to me that such work was possible on a one-off basis. As an experienced and qualified woodworking machinist, I was familiar with a wide range of machines designed to mass-produce complex wooden shapes, but I had no idea it was possible for a lathe to produce individual pieces shown in these albeit schematic drawings. The idea that one could produce three-dimensional work on a wood turning lathe set me on a course that has lasted many years.

### Three good reasons

A picture is worth a thousand words, as the old saying goes. It's true; a tremendous amount of useful information could be gathered from Bergeron's drawings.



# Turning the impossible

**Most turned work is essentially two-dimensional; the shape you see is just a silhouette. But what if you could create something more complex and truly three-dimensional? Rod Tallack can**

However, for me one thing was becoming clear: this was not a machine to produce work rapidly. I was beginning to understand why three-dimensional woodturning was not a familiar everyday practice. There were at least three reasons I could see:

- the sheer number of complicated mechanisms involved;
- the cost involved in building these mechanisms;
- the amount of time it would take to produce anything of interest on the lathe as illustrated.

What I had in mind was a lathe that could

produce three-dimensional woodturning of a high standard but without the intricate detail, and in a reasonable time. This brings me to the point of this article; how the design of the lathe evolved that produced the work illustrated.

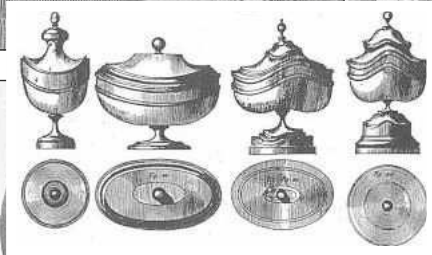
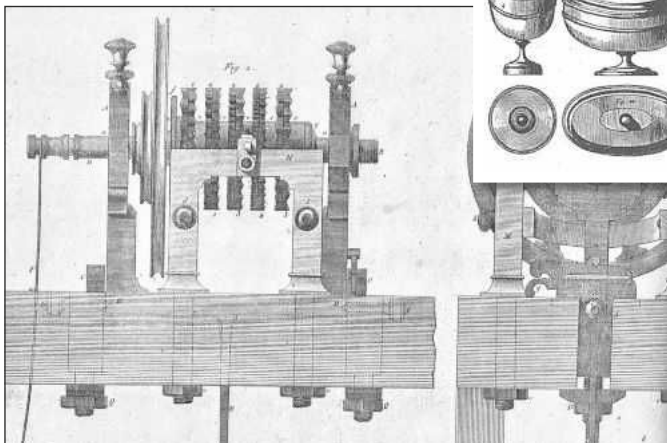
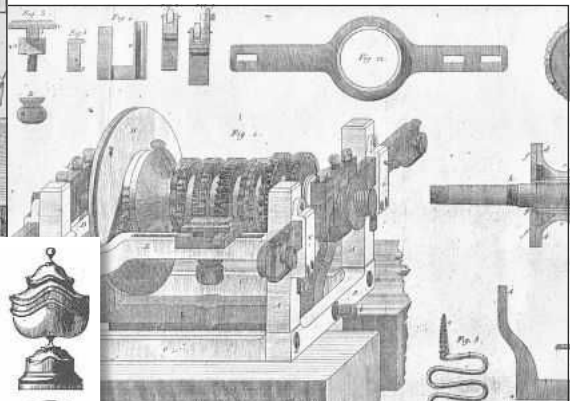
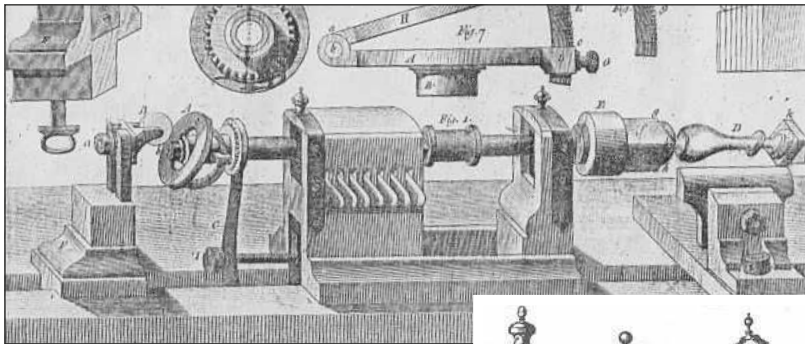
### The big end

The headstock has to be central to any lathe design, and was the logical place to begin. The primary requirements are mass and rigidity, together with provision for a rotary-linear bearing for the main shaft/mandrel. Steel and cast iron would provide

the necessary mass; the choice of bearing would be critical to the design.

Some research located a firm that manufactures a range of suitable bearings, and I selected two that might meet my requirements. However, it was down to me to design the mandrel. The bearing people would machine it to my dimensions and then harden it to suit the chosen bearings.

The length of the mandrel was the next decision. Bergeron's plates for the linear action showed a leaf spring controlling the movement via a rear-mounted cam; the alternative would have to be a coil spring



Bergeron's original drawings were the inspiration for my first attempts at making a sculpture turning lathe and creating work like the pieces he illustrated

mounted concentrically on the mandrel. After a discussion with a spring maker, I made an intelligent guess as to the strength required and the expert decided the gauge.

I now had enough information to design the headstock. I made a suitable wooden pattern, had the headstock cast in iron and took it to a local engineer for machining. Fortunately, at the time (some 20 years ago) there was an iron foundry and engineering works nearby, but they've all vanished now and the area is a housing estate!

## Creating the bed

This was to prove quite straightforward. A trip to the local scrapyard produced two 5ft lengths of steel channel with a 6 x 3in cross-section. These were part bolted and part welded together, giving a good strong base on which to mount everything. It did require that the top face be flat, and a local engineer did this for me. Then, using some slotted angle iron framing, I made up a leg assembly to carry the bed.

## The difficult part

The next challenge was to work out how to achieve anything other than circular movement when rotating the work on a common axis. The wood being machined needs to move horizontally while at the same time rotating; in other words the workpiece must cross the lathe bed and

rotate at the same time. I returned to Bergeron's plates for inspiration.

I ignored the mechanisms using complex gear trains as being much too intricate and costly. However, there was an illustration showing a series of cams mounted on the mandrel, with a fixed cam follower selecting a particular cam. This caused the mandrel together with the headstock to move horizontally across the lathe as it rotated.

To achieve this, the headstock had to be pivoted roughly level with the lathe bed, meaning that the movement was part of an arc (although the amount of curvature would be so small as to be unnoticeable). The idea of a selection of different cams as opposed to gear trains seemed the way to go, and it was this idea that initiated the conception of a primary faceplate that could be controlled by cams – in other words, an intermediate faceplate moving horizontally across the lathe bed while rotating.

## The primary faceplate

The initial design for this unit consisted of a disc mounted on the end of the mandrel. Radiating from this disc were eight spring-loaded pins, which engaged with an outer drum. The function of the pins was to keep the outer drum concentric with the disc. The drum had front and back plates screwed to it, enclosing the disc and keeping the two constant in one plane but



Image A shows a piece of laburnum 180mm square and 50mm high. Along with the square shape, the effect of the end movement of the rear cam is evident with the sloping top of the piece.



Image B is a piece of sapele 210mm square and 70mm high. This shows that the effect of the cam can be cancelled, with the lathe returning to circular cutting.



Image C features a piece of mahogany that has been shaped using random settings together with a seven-sided cam, also utilising the compound slide facility on the primary faceplate.



allowing limited free movement in the other two planes. On the front plate, a screw thread had to be built in to facilitate the mounting of a conventional faceplate to carry the work.

Various cams were made from plywood and bolted to the drum. The assembled unit, when rotating, would be controlled by a fixed cam follower set at the same height as the cutting tool, thereby generating the shape of the cam onto the work.

I made wooden patterns for the disc and the drum and had them cast in aluminium. The front and back plates were fashioned from mild steel. It seemed a good idea at this time to fit the front plate with a compound slide-way, enabling the main faceplate to be re-positioned in relation to everything else.

Incidentally, a couple of tool rests would be necessary, so wooden patterns were cut and these were cast in iron at the same time as the headstock.

### The first trials

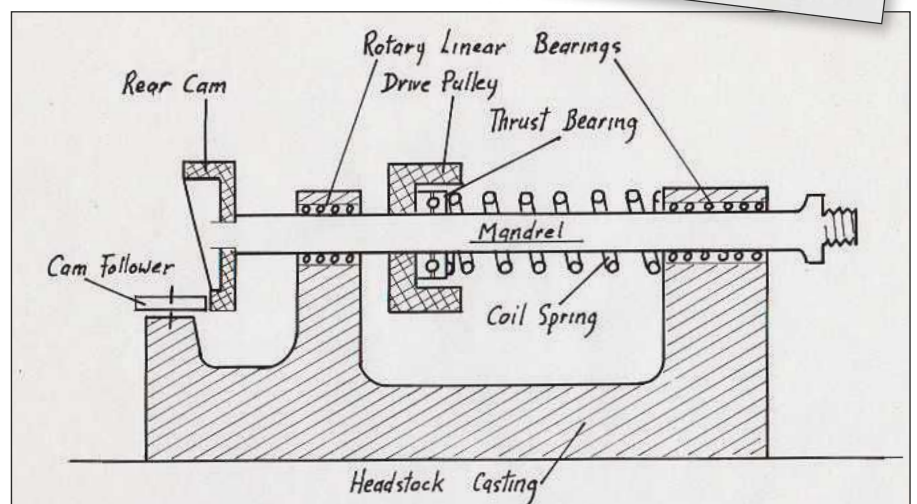
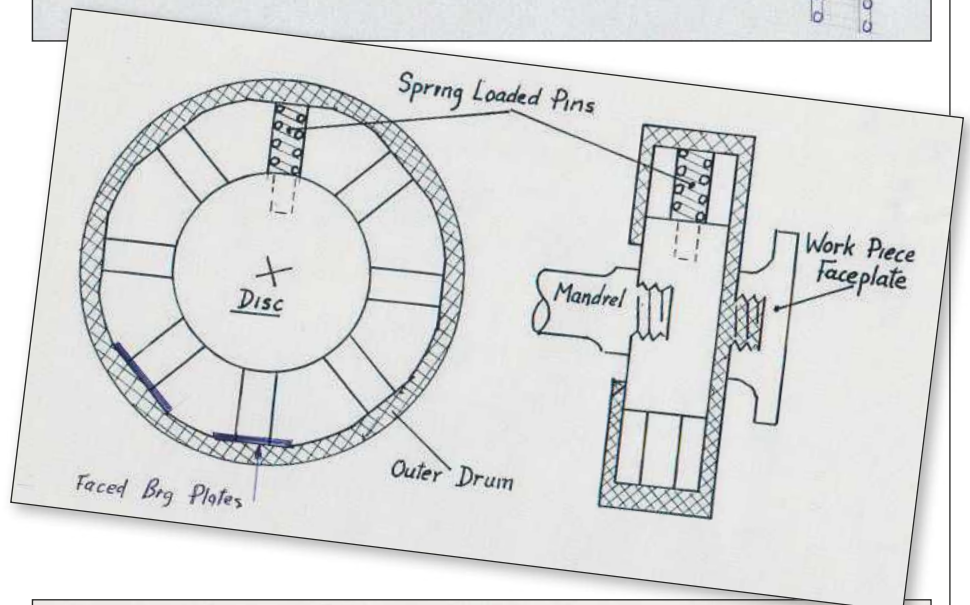
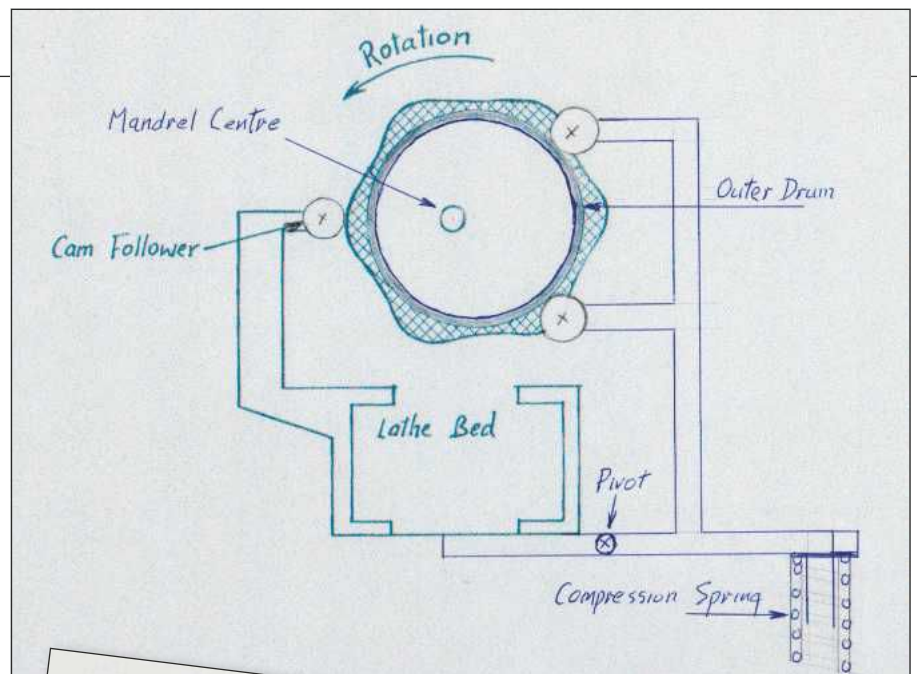
With all the parts made and assembled, the Mark 1 Sculpture Turning Lathe was set for its first trials, which sadly were not at all successful. The shape of the cam proved too ambitious; there were too many changes in the shape, and the rate of change from the mean circle was too rapid. No problem: cut another cam. With a revised cam fitted the first piece of turning was completed. It wasn't brilliant, but it did prove this was the way to go.

The next problem was rather more serious. The primary faceplate didn't work as anticipated. The fault lay with the springs; essentially they were too short for the job. The solution was one of necessary expediency, a question of making do. From a pivot point bolted to the side of the lathe bed I fitted a spring-loaded arm carrying two ball races/ball journals that were positioned to apply pressure to the outside of the primary faceplate drum assembly. The spring was good and long, a cannibalised front fork from a motorbike.

After several more trials another problem arose. The wooden cams were not up to the job as they couldn't stand the buffeting. Aluminium was chosen as being the next best material, so I made wooden patterns of some cams for casting in aluminium.

### More trials

After a variety of modifications and further trials, using hand-held chisels proved unsatisfactory. The workpiece was moving back and forth across the lathe bed; also, the work was accelerating and decelerating



These early engineering drawings illustrate some of the components of the Mark 1 lathe

as the cam passed the cam follower. However long a handle was fitted to a chisel, it was very difficult to maintain any sort of control. It became necessary to replace the chisels with a powered cutter.

A trip to the breaker's yard produced a parting-off slide unit from a capstan lathe. This was adapted to carry a router and fitted onto the lathe bed. The router, fitted with a

suitable cutter, proved much more satisfactory. I now had a working lathe on which three-dimensional turning could at last be fashioned.

### A helping hand

Shortly after this stage of development, a friend of one of my sons came and asked if he could gain some experience using the

## WHAT SCULPTURE TURNING CAN CREATE



This section of oak had been in store for a long time. The shrinkage cracks were filled with a brass/resin mix, and both end and side cams were used to create the shape



Odd pieces of ash and laburnum were glued together to produce this bowl, using the same cams as before



Both side and end cams were used on this piece of yew. In an effort to create a bit more interest, both cams were then cancelled and the lathe was returned to circular work



This pentagonal cherry bowl is mounted on a circular mahogany base. The unusual profile at the top was created by using an end cam when cutting on the outside but removing it when cutting the inside

A gift of some iroko was appreciated, but the sizes required a lot of cutting and gluing to create a piece for turning. The plainness of the wood needed lifting, hence the introduction of the ash and aluminium inserts

lathe. This was agreeable, as he did not want any payment, other than having half of whatever he made that was in any way interesting. It meant I could get on with earning my living while still overseeing the progress of the lathe. Images A, B and C on page 72 show three of the pieces he made.

### Creating the Mark 2 lathe

Over the years my own business operation expanded. I was able to take on extra workers, so I had some free time. With the experience I had, it was time to think about a new lathe.

The design of the Mark 1 lathe was influenced by Bergeron's drawings, which with hindsight was not such a good idea. It was back to the drawing board... again.

The lathe that is the subject of this article was developed to produce woodturning that is not only different to either traditional woodturning or ornamental turning, but also creates turnings that cannot be done by either group. To my mind, there was a gap between ornamental and traditional turning to be filled, and the rationale behind this exercise was to fill that gap.

I think there is a need to introduce a facility to turn in three dimensions and create a new challenge for the artist turner. Whether a machine manufacturer would invest in adapting the lathe for a small production run remains to be seen.

The Mark 2 lathe (shown below) could really do with redesigning, but the facilities and time required are no longer available to me. Nevertheless the lathe, as it is, is a challenging piece of equipment to use and serves its purpose in keeping me occupied in my retirement.

For recent developments in sculpture turning work, please take a look at the site [www.sculptureturnery.co.uk](http://www.sculptureturnery.co.uk)



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On top of the tool is the two-position gear selector. The main handle houses the variable speed power trigger and the sliding

direction-of-rotation switch. There is also an LED worklight mounted just above the trigger. The battery slides easily onto the base of the tool and a charge indicator is integrated into its mounting. There is also a clip to hold a pair of screwdriver bits on one side and a metal hanging hook on the other.

The drill is supplied with an extremely long side handle. This clamps to the nose and incorporates a depth stop for accurate drilling.

### Using the drill

This is an impressive tool to use. It feels light and well balanced, and is comfortable to hold. The side handle is a real bonus, giving excellent stability and control especially when using large-diameter



The combi drill is supplied with a long side handle and a built-in depth stop



The useful hook allows you to hang the tool from a belt or pocket



There's a handy stowage space on the base for a pair of screwdriver bits





The long side handle greatly improves control when drilling large holes



The compact body on the impact driver facilitates one-handed operation when appropriate

bits or holesaws. The LED light provides bright illumination and, rather handily, remains on for 10 seconds after the trigger has been released. The hanging hook is also a very useful feature, making it easy to park the tool on your belt or hang it on your pocket.

### The impact driver

This is another compact tool. It has a short body with a locking bit holder. It also has an LED worklight and a variable speed trigger with a sliding direction-of-rotation switch. Again the body is extensively covered with softgrip rubber, and there's also a hanging hook on the end of the handle. There is no battery charge indicator.

### Using the driver

This is a wickedly powerful tool. I used it to make some car ramps using scaffolding boards and treated timber. Very long screws were needed for strength and safety, and the Makita drove them deep into the timber without hesitation, or any pre-drilling. In fact, they were so secure that it was impossible to remove them!

### Summing up

Both these machines perform faultlessly. They are powerful, convenient, well balanced, and can be charged in less than an hour. They are robust, thoughtfully designed and supplied in a sturdy storage case. There is little to criticise here. If you want a top-quality pair of professional tools, try these. **AS**

## SPECIFICATION

### COMBI DRILL

BATTERY		18V 4Ah Li-ion
CHUCK		13mm keyless
SPEED RANGES		0-550 & 0-2100rpm
MAX TORQUE		125Nm
MAX DRILLING CAPACITY	wood	76mm
	masonry	16mm
	steel	12mm
WEIGHT		2.7kg

### IMPACT DRIVER

<b>BATTERY</b>	18V 4Ah Li-ion
<b>NO-LOAD SPEED</b>	2500rpm
<b>IMPACT RATE</b>	0-3200bpm
<b>MAX TORQUE</b>	160Nm
<b>WEIGHT</b>	1.5 kg

**ACCESSORIES** MacPac case, two batteries, charger

## VERDICT

These are two remarkably powerful machines that are well made and easy to use.

**PROS** ■ Plenty of power  
■ Fast charging  
■ Robust construction

**CONS** ■ Not cheap!

**VALUE FOR MONEY** ■■■■■■

**PERFORMANCE** ■■■■■■

## FURTHER INFORMATION

- Makita
- 01908 211678
- [www.makita.com](http://www.makita.com)



The LED worklight stays on for 10 seconds after the trigger is released



The short body on the impact driver allows it to fit in tight spaces



The compact yet powerful batteries slide into place easily on the base of the tool

*Good though a hand-held circular saw is, a saw bench is so much better with its height-adjustable and tilting blade and cross-cutting facility, all combined with a good-sized work table*

## Scheppach HS100E table saw

£159

These features can all be found in the recently launched Scheppach HS100E table saw, aimed primarily at the home workshop. It is constructed almost entirely of pressed steel, with the rip and mitre fences being alloy extrusions. Some simple assembly work is required, but this is straightforward enough. All the top surfaces of the three-part table are powder-coated for a long life.

### Fence performance

The rip fence will locate to either side of the blade, and is held in place by a cam lever which locks it to the rail at the front. This rail only extends along the front of the main table so the ripping width is limited, although a temporary fence could be cramped to the right-hand extension table if required.

The supporting rail is graduated, with the anchor part of the fence having a useful magnifier built in. The fence itself can be used with either the high or low edge guiding the wood, and it can also be adjusted forwards and backwards. The mitre fence too will locate to either side of the blade, and can be adjusted by up to 60° to the left and right. The fit of the fence in either of the slots is not the best, however.

### Blade adjustment

The blade is raised and lowered by operating the large handwheel at the front of the machine, with a second knob on the same spindle as this handwheel being used to control the tilt setting of the blade. This is up to 45° to the left only, with a protractor scale being provided as an aid to setting this angle, and a small lever to lock the setting.



The rip fence anchors firmly to the front rail and features a useful magnifier



The mitre fence can be installed to either side of the blade



The access panel is easily removed when needed for blade changing





Mitre cuts can be made at up to 60° to the left and right

### Using the saw

Rip cuts were where I started my trials, my first cut being close to the maximum width possible using the fence. Setting this is easy, thanks to the magnifier and the cam lever. The high speed of the blade make the saw a little on the noisy side, but cutting was smooth and effortless. Thinnish material automatically raised the crown guard, allowing the wood to pass readily forwards, but with thicker pieces, a little manual help was needed to raise the guard.

Next it was on to some bevel ripping. Inevitably when the angle of tilt is at its maximum, the depth of cut is reduced, but the sawing remains just as straightforward and effective.

### Using the mitre fence

Cross cutting can take place with the mitre fence located to either side of the blade, and while the face of the fence offers good support to the wood, there is a hint of slack between the bar of the fence and both the corresponding grooves in the table. This can be countered by always adopting a slight clockwise twist to the fence and the wood as the cut is made. Because of the fairly large size of the teeth on the blade, the surfaces produced when cross cutting are less smooth than rip-sawn surfaces.

Bevel cross-cuts can also be made by keeping the mitre fence set at 90° and tilting the blade. Compound cuts can be produced by a combination of a mitre cut and a bevel cut.

### Summing up

So did the HS100E live up to expectations? I would like to see a longer front rail included, so that the fence can be operational across the right-hand table extension; this would greatly increase the ripping width. Secondly, an improved fit of the mitre fence in the table slots would promote cross-cutting accuracy.

It has to be remembered that this is a basic machine with limited refinements, aimed at the woodworker who needs a saw bench with good capacities but does not need the finest performance. **GW**

## SPECIFICATION

<b>MOTOR</b>	1500W
<b>BLADE DIAMETER</b>	254mm
<b>NO-LOAD SPEED</b>	2000rpm
<b>TABLE SIZE</b>	640 x 445mm
	with extensions 640 x 945mm
<b>MAX DEPTH OF CUT</b>	at 90° 75mm
	at 45° 65mm
<b>MITRE RANGE</b>	± 60°
<b>WEIGHT</b>	24.5kg

## VERDICT

This saw represents good value for money, and is sufficiently robust to give years of service.


**PROS**

- Simple assembly
- Easy adjustments
- Good cutting performance

**CONS**

- Front rail a little short
- Poor fit of mitre fence in table slots

**VALUE FOR MONEY** 

**PERFORMANCE** 

## FURTHER INFORMATION

- NMA Agencies
- 01484 400488
- [www.nmatools.co.uk](http://www.nmatools.co.uk)

Bevel cross-cutting is carried out by tilting the blade as required



Ripping was smooth, but the width is reduced by the short front rail



The maximum cutting depth is still a generous 65mm when bevel ripping



Cross-cutting can be done with the mitre fence at either side of the blade

If you do a lot of small-scale woodworking – making models or ornamental boxes, for example – you may find a standard jigsaw a little unwieldy. This compact model from Proxxon could be the answer

## Proxxon STS/E Super jigsaw



This Proxxon jigsaw has an overall length of 200mm with a 50mm diameter body. The 100W motor is not rated for continuous use and should be rested every ten minutes. The reinforced polyamide body has a strong hanging loop at the rear. Like most of Proxxon's range of similar-sized machines, this one comes in a strong plastic storage box with a fence, two Allen keys and four blades. These are not standard jigsaw blades, however, and only Proxxon spares will fit.

### Standard features

The saw has a die-cast aluminium head with a small soleplate that can be tilted to the left or right and locked by means of an Allen key. The fence is secured with two screwed knobs. The soft grip on the underside makes the jigsaw very comfortable to hold.

The on/off switch and the variable speed dial are located at the top rear of machine, and are awkward to use here. It would be much better if they were at the front within easy reach of the fingers, so the saw can be turned off instantly.

### Preventing vibration

When you cut with any jigsaw, it's essential that the wood is cramped securely to the edge of the bench so that it overlaps slightly. If the wood is thin and the overlap too great, the material will vibrate. If you have a Workmate-type bench, you can position the wood over the centre gap and cramp each side securely. This is a safer way of cutting and greatly reduces the vibration.

There is no guard on the upper part of the blade between the



The blade is inserted into the head and locked with a small hex grub screw



The fence is secured with two screwed knobs and is held reasonably firmly



Thin workpieces must be securely cramped to the workbench to reduce vibration





Internal cuts needed fairly large entry holes to admit the saw blade

blade holder and the soleplate. One *could* be provided, whereas it's not possible to guard the part of the blade under the table. The operator needs to be aware at all times, when the machine is running, that the unguarded blade is out of sight under the work. If you use your right hand to operate the jigsaw, keep your left hand well out of the way.

### Keeping straight

The machine was quite difficult to use with and without the fence because there is no dust blower. It's almost impossible to follow a marked line because it quickly becomes obscured by sawdust. Any jigsaw creates sawdust, but as a mask is required the operator is unable to blow away the dust when using this machine.

The fence is held reasonably firmly, but the blade can wander and therefore a straight cut can't be guaranteed. When cutting some 4mm thick plywood, the cut was rather rough and the wood vibrated too much. It was easier to use the saw without the fence.

Some woodworkers may consider purchasing this jigsaw for cutting out shapes such as doll's house window openings. After drilling a hole in the corners of the rectangle first and making four separate cuts, the results were satisfactory but some cleaning up was necessary. The hole drilled had to be quite large for the blade to pass through.

### Summing up

The conclusion must be that, although the machine is well made and finished, this jigsaw is an example of a scaled-down version of a popular workshop tool which is not really suited to downsizing. There is little to be gained in miniaturising a jigsaw, and quite a lot to lose in stability and accuracy.

This model is presumably designed with the modeller in mind who wishes to cut thin material. It is useful to have a small machine which can easily be stored when not in use, but the high price of this tool would be much better spent on a small scrollsaw which would give a superior cut and offer greater versatility. *IW*

### SPECIFICATION

<b>MOTOR</b>		100W
<b>NO-LOAD SPEED</b>		2000-4500spm
<b>STROKE</b>		3mm
<b>BASEPLATE TILT</b>		± 45°
<b>MAX DEPTH OF CUT</b>	wood	12mm
	non-ferrous metal	3mm
	steel	0.5mm
<b>WEIGHT</b>		700g
<b>ACCESSORIES</b> moulded case, fence, four blades		

### VERDICT

Disappointing: the money would be much better spent on buying a small scrollsaw.

**PROS** ■ Well made  
■ Comfortable to hold

**CONS** ■ Takes only Proxxon blades  
■ No dust blower  
■ Awkwardly-placed controls  
■ Blade tends to wander

**VALUE FOR MONEY** ■■■■■  
**PERFORMANCE** ■■■■■

### FURTHER INFORMATION

■ Brimarc  
■ 03332 406967  
■ [www.brimarc.com](http://www.brimarc.com)



Viewing the cutting line is awkward, and there is no dust blower



The saw is easier to use freehand, and cut curves satisfactorily



The on/off switch and speed control would be better sited at the front of the tool

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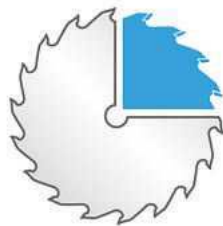
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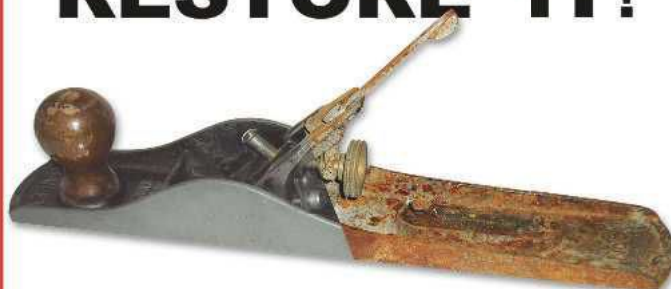
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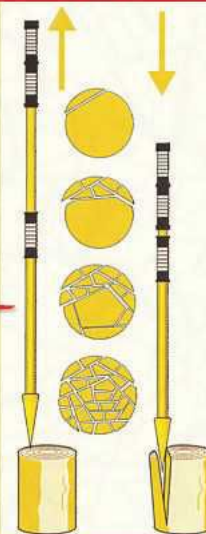
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**01547 529305 (Powys)**

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**01526 388685 (Lincolnshire)**

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## WANTED

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**Woodworker**  
MARKETPLACE



# In your own write...

Here are just a few of the latest letters we've received since the last issue. Drop us a line on paper or via screen and keyboard to add your voice to the woodworking crowd; you might be one of the lucky few who will manage to get their hands on a coveted Woodworker badge!

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## IMPERIAL RETURNS

Dear Mark

I bought these 1in No 8 screws the other day from a well-known supplier on an industrial estate near where I live. I was amused to see that they have recently started putting Imperial sizes back onto their boxes after a very long absence. Does any other reader find this peculiar?

Keep up the good work, I'm currently making a pair of small tables like the ones you had in the magazine not long ago.

Regards

**Charles Bennet, Guildford**

*That's funny, Charles. It seems like a bit of a backwards step to me. I occasionally hear of 'eights' and 'tens' when I'm on site, but most tradies I know are very comfortable with metric fixings. One thing's for sure though: we can't blame Brussels for this one!*

*Mark*

## A BETTER BACK

Hi Mark

I read your pages avidly to find new ways of making dust out of good timber, and I hope you can help to guide me with my latest challenge. We've re-arranged our bedroom so that the backs of the Ikea wardrobes are now visible. Obviously the hardboard back panels need to be replaced by something more attractive, and, as they are no longer supported by a wall, they need to be made more rigid too. My dilemma concerns the edges. If I use thicker material, it will show where it exceeds the depth of the rebate. Can you or your readers suggest a solution?

**Dave Cross**

*This is quite a good question, Dave. If you were to go ahead and simply replace the hardboard backs with a thicker board, as long as it was a perfect fit into the rebate it wouldn't look too bad.*

*If the existing back panels are flush with the sides, you could just plant a new back on and make a feature of it, but the only way of really hiding the edges of the new, thicker back would be to deepen the existing rebate to match the thickness of the chosen board. You'd still have the raw carcass edges to deal with, though. Tricky... If anyone out there has a better solution for this problem, please let us know!*

**Mark**

## PEEL AND STICK

Dear Sir

I wonder if you could help me with a problem. I have a wardrobe door covered in a plastic veneer which has started to delaminate. The door is made from mdf with trenched mouldings and rounded-over edges. These are also lifting. Could you please recommend a suitable adhesive which I could use to refix the veneer to the mdf? I am not sure about using pva adhesive.

Yours in anticipation

**K Dawson**

*This type of door is described as being 'foiled'. This means it's moulded in one piece with a very thin layer of plastic laminate as an outer skin. This can look good when new, but it has a limited lifespan. You need a glue that will stick plastic to mdf, and fortunately there are a few contenders.*

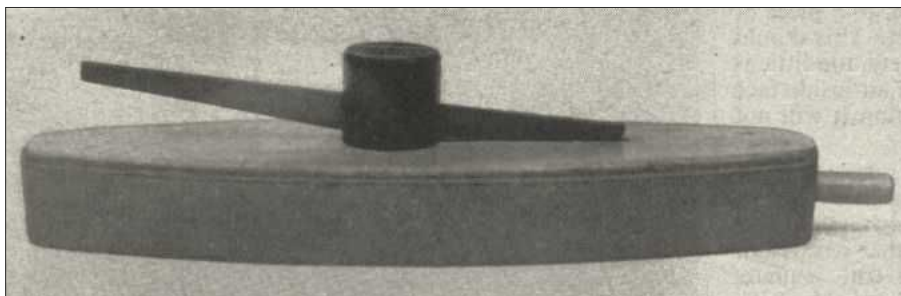
*I'd avoid superglue; it would likely do the job but it will probably end in tears. On a bigger job, an impact or contact adhesive would do the trick, but you'll be working it into gaps on edges and so that's not suitable either.*

*I think your best bet will be one of the many all-purpose glues that come in a small tube with a fine nozzle to help you apply the glue where it's needed. After you've squeezed enough in, use masking tape to hold the edges down and leave it overnight to be on the safe side. You can then trim off any squeezed-out glue with a sharp knife. Good luck!*

**Mark**

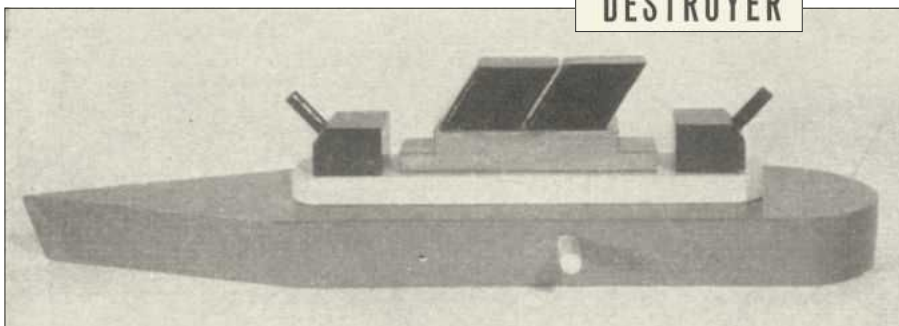
# Submarine Commander

Some of you may recall an electro-mechanical slot machine of this name in the amusement arcades at the end of the pier on childhood seaside holidays. With its realistic periscope viewer, dramatic tension and spectacular effects when you finally 'sank' one of the ships on the distant horizon, it was a hit with everyone... including me

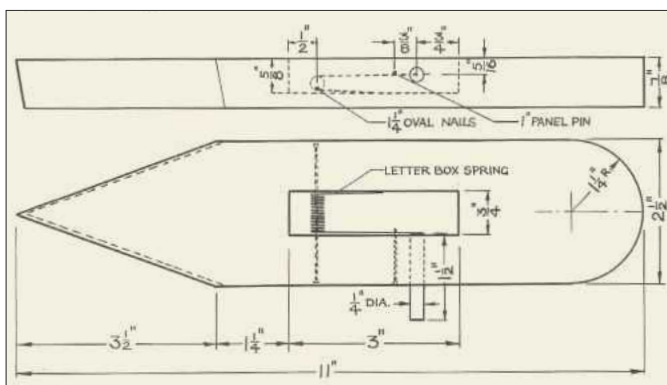
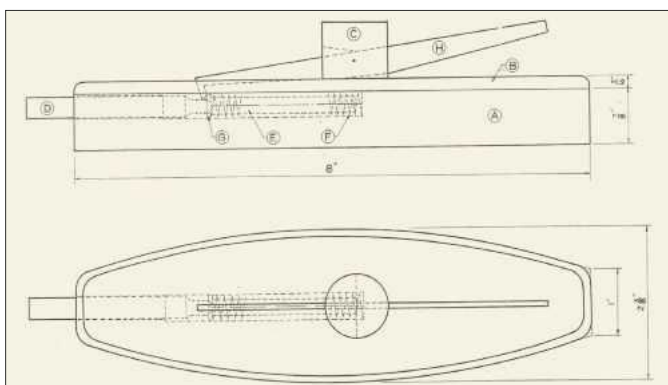


TORPEDO-FIRING  
SUBMARINE

Leafing through a copy of *The Woodworker* from July 1964 (the mid-sixties are fast becoming one of my favourite *Woodworker* eras), I came across a couple of pages dedicated to this Torpedo-Firing Submarine. Now, there's nothing like a toy that fires some kind of projectile, and this one appealed instantly to the child in me (actually quite a sizeable child, if the truth be known). It soon became clear that the submarine project (possibly known as Operation Poseidon)



EXPLODING  
DESTROYER



was a response to eager reader requests for an adversary for the Exploding Destroyer published earlier in the year in the March issue.

## Battle stations

A few intense minutes of frantic searching in the dusty *Woodworker* archives located the aptly-named Handicraft Teacher's Page, and I was soon reading with interest a similar article showing just how one could go about building a model ship which would 'explode' when cleanly struck amidships. Interestingly, the project was introduced by its writer as similar to something he had been given as a boy over 40 years earlier, dating the original

warship to just after World War 1.

The 'shipwright', Mr E F Scott, went on to inform us that his present classes of boys were still greatly interested, and I strongly suspect that even now, these simple toys would have a surprising amount of appeal to youngsters today.

## Springing into action

Both of the vessels are simply constructed from scraps, offcuts, bits of dowel and – most importantly – a spring or two, notably a letterbox spring inside the warship to lift the superstructure of this doomed destroyer. I'm seriously tempted to make my own

variations of this brace of battlers. It would be good to be able to even things up a bit and make the submarine 'sinkable', but at present, and short of some kind of depth-charge addition, I can't think of how to do it. So, if there are any nautical types reading this who have an idea or two of what might be done, I'd love to hear from you. Maybe we could do battle together!

*Mark*

More from *The Woodworker* archive next month...





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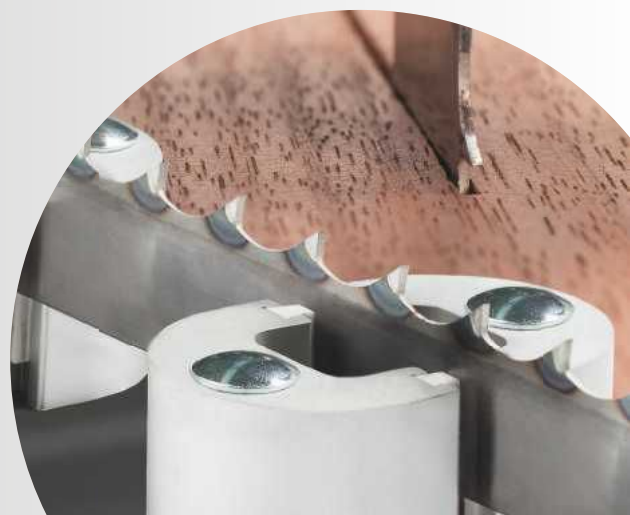
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